

# THE LARYNGOSCOPE.

---

VOL. LI

FEBRUARY, 1941.

No. 2

---

## DISEASES OF THE LARYNX. MATERIAL ABSTRACTED DURING THE YEAR 1940.

DR. HENRY BOYLAN ORTON, Newark.

### ANATOMY AND PHYSIOLOGY.

Schugt,<sup>1</sup> in summarizing, states that the following findings in an examination of the pyriform sinus for possible malignant infiltrations should be considered:

1. Deviation of the larynx to one side.
2. Enlargement of the diseased pyriform sinus.
3. Shallowness of the pyriform sinus through bulging of its floor.
4. Hardening of the thyrohyoid membrane.
5. The presence of small glands on and to the side of the thyrohyoid membrane.

According to Waldapfel,<sup>2</sup> between the epithelium of the vocal cords on one hand and the elastic and muscular tissue on the other hand, there exists a very thin layer of loose connective tissue which can be artificially injected and is immensely capable of expansion, which Reinke was the first to point out.

A series of pathological changes are shown which take place in Reinke's space. One of the most typical of these changes is the diffuse subepithelial edema of the vocal cords which may occur in various processes in and surrounding the

---

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Feb. 1, 1941.

vocal cords; for example, in the cases discussed here, a carcinoma of the ventricular cord, trichinosis of the vocal cord, and also as an affection *sui generis* in chronic irritation of the vocal cord.

The polyps of the vocal cords have the same basic substance as Reinke's layer and are characterized, like this layer, by a lack of muscular fibres and elastic tissue and are growing out of this layer under a common epithelium. They are to be regarded as circumscribed edema of Reinke's layer with secondary inflammatory changes. The submitted findings confirm Hajek's theory of the nature of laryngeal polypi.

The tuberculosis of the vocal cord can originate from Reinke's space. It fills it and remains temporarily limited in this space before spreading. Whether or not this is a rule and what rôle Reinke's space plays in the localization and growing of the tuberculosis of the vocal cord can only be revealed by further examination.

In the leukemic infiltration of the vocal cord, likewise, the Reinke's space is affected, but only in its upper part adjacent to the ventricle. For the acute inflammations of the lymphoid tissue of the vocal cords the same localization can be assumed.

The carcinoma of the vocal cords develops in its early stages only toward Reinke's space. A transgression of this area is barred in these stages by barrier-like boundaries and lack of lymph vessels in Reinke's space. Both explain the very slow growing and very late affection of the lymph glands in carcinoma of the vocal cords.

The results from the examples discussed here show that there exists a real pathology of the subepithelial layer of the vocal cords, that various formations and processes of the cords originate from this space, develop entirely in this space or are limited to it in early stages before they affect other layers of the larynx.

The knowledge of these anatomical and pathological conditions is of importance for the clinical diagnosis, prognosis and therapy of the diseases of the vocal cords.

#### EXAMINATION OF THE LARYNX.

Dean, Cone, Burton and Moore,<sup>3</sup> in referring to the use of laminagrams in laryngology, state that in common with all

Roentgenography, that known as body section Roentgenography is of the greatest use where there is the natural contrast in density, which obtains more fully in the case of the respiratory tract than elsewhere. The laminagraph early demonstrated the fact that lesions in the pulmonary area, completely undiscoverable by any other method of examination, were clearly demonstrated and accurately located. Somewhat later it was found revolutionary in the examination of the paranasal sinuses, particularly in the posterior ethmoid and sphenoid cells. It has contributed heavily to a more complete understanding of lesions involving the larynx and holds great promise for the study of subglottic involvement. Farther down the tracheobronchial tree not only is information obtainable in the larger divisions but occasionally information is discovered in bronchial branches, the size of which is of the order of 3 to 4 mm.

Pressman and Hinman,<sup>4</sup> reporting on further advances in the technique of laryngeal photography, state that since 1937 it has been possible to improve upon the method reported at that time. Changes in technique since then have resulted in certain advances in addition to those described in the original article. These are:

1. The image is maintained at a fixed position upon the center of the screen.
2. Absence of objectionable glare surrounding the laryngeal structures.
3. Disappearance of the spots of reflected light upon the larynx.
4. Photography in color which very closely reproduces the true color of the larynx.
5. Slow motion (in black and white up to 128 frames per second), which represents a slowing to about one-eighth normal speed at the usual projection rate of 16 frames per second. This, of course, does not compare with the Bell Telephone Co.'s films at 4,000 frames per second, which, however, requires highly specialized technical equipment.
6. A very satisfactory adjustable focus, usually upon the entire depth of the larynx at the same time.

7. Photographs which are well centered.

8. Successful photography in about 90 per cent of the footage of film exposed. This obviously presupposes an adequate exposure of the larynx with the direct laryngoscope.

9. Magnification is adequate and can be increased at will. We have arbitrarily selected our magnification so that it is great enough to show details quite clearly and yet not so large that it precludes the possibility of photographing the entire length of larynges that are larger than average. For the sake of standardization, we use the same magnification in all cases.

It is not to be assumed that the method has no disadvantages as compared with other methods, or that it even approaches entire satisfaction. Its shortcomings are apparent and to us appear as follows:

1. Cocainization is necessary in all cases, whereas in indirect photography it can often be omitted.

2. Direct laryngoscopy is not always a desirable procedure, especially in well trained singers or nervous people, who often hesitate to submit to the procedure lest their voice be harmed, which, of course, should never happen. It is, however, difficult to convince them of this; furthermore, the larynx cannot always be adequately exposed for photographic purposes.

3. In certain diseased larynges, such as severe acute infections, or in exquisitely sensitive pathological larynges, the direct method of exposure may be contraindicated.

4. Extremely brilliant lighting such as is required for the Bell Telephone Co. photographs at 4,000 frames per second cannot be utilized by the direct method. The inclusion of a stroboscope, however, in the photographic equipment now being used can by the direct method result in color photographs reduced to a speed approaching 24,000 frames per second, or a reduction to  $1/1,500$  normal speed. We have not yet attempted this. The stroboscopic picture, of course, is not a true picture of a single movement. Stroboscopic lighting has already been used and reported upon by Tiffin and Moore.

5. There is possibly some objection from the standpoint of physiological study to the stretching of the cords as a result



of the anterior "lift" of the laryngoscope; however, comparison of our photographs with those taken by the mirror method would seem to indicate quite definitely that this does not in any appreciable way distort either the appearance or action of the cords, regardless of the type of activity taking place. In one case of weakness of the internal tensor muscles with exaggerated bowing of the vocal cords, we felt that the image was possibly distorted, but in no other single instance did this hold true. Our photographs have otherwise invariably proven to be exact reproductions of the larynx as seen with a mirror. We have made such control observations dozens of times and under all circumstances.

6. The method does not permit photography of the larynx and epiglottis at the same time. The elimination of the image of the epiglottis is, however, often a distinct advantage, since only too often it hides the vocal cords, or portions of them. This is especially true when photographing the larynx during the production of its sphincter action, as in cough, swallowing and thoracic fixation.

*Speech:* Mithoefer<sup>5</sup> reports that it is his purpose to discuss a simple method of treatment to be applied not only to defects of the singing but also to defects of the speaking voice encountered in daily practice. Public speakers, teachers, actors and preachers often consult the laryngologist for a defect of the speaking voice, but there is also a vast number of patients who misuse the voice and whose defect remains unrecognized and improperly treated.

Local causes, such as chronic laryngitis, singer's nodules, dilated blood vessels of the vocal cords, enlarged lingual tonsils, infected faucial tonsils and adenoids, abnormalities of the nose causing obstruction and disease of the paranasal sinuses, may be contributing factors.

The chief cause is usually misuse of the voice. This, according to Flatau,<sup>6</sup> may be quantitative or qualitative. The first applies to the use of the voice for too long a time, and the second to a faulty method. Qualitative factors may be summarized as follows: forced fixation of the larynx, coup de glott — i.e., rapid approach of the vocal cords in reaching a note — improper use of the lips, tongue and lower jaw, insufficient and forced vocalization, improper breathing, lack of

relaxation and the use of the voice in the presence of an acute infection of the upper part of the respiratory tract.

One of the first symptoms complained of by the patient is a feeling of fatigue in and about the larynx. The laryngeal examination may reveal changes in the form and disturbances in the movements of the vocal cords. The following changes may be seen: singers' nodules, glandular cysts, irregularity of the free edge of the cords, thickening of the interarytenoid space and changes in color. Singers do not have a normal color of the cords. There is usually a rose-like tint, more pronounced after singing, which is in reality an occupational hyperemia—in a way, a physiologic change. The disturbance of movements of the vocal cords may be twofold: 1. there may be a lack of movement, with incomplete closure, and, if the paresis is mild, there may be some difficulty in recognizing its presence; 2. fortunately rarely, the adductor muscles may be so strong that the arytenoids override and asymmetry results.

The question often arises—when should tonsillectomy be performed on a singer? The decision is easily reached if it can be shown that chronic infection of the tonsils is undermining the general health of the singer and that the infection is interfering with proper movements of the soft palate. When it has been decided that a singer needs tonsillectomy, it is well to establish before the operation is undertaken whether there is a defect of the singing voice. The tonsillectomy cannot, therefore, be blamed for a detonation discovered before the operation if it persists after healing is complete. The operation itself should be done with the greatest care, so that injury to the soft palate is reduced to a minimum.

Greene<sup>7</sup> states that speech is articulated voice and may be described as a systematic grouping of purposive organized sounds conveying complex meaning. The normal sounds of speech require not only the vocal cords and pulmonary apparatus but the oral and nasal cavities and the lips, tongue and teeth. The waves set up by the vibrations of the vocal cords are modified by these structures and thus differentiated into the various sounds of speech. Further, these structures are under the control of the central nervous system, and ideas arising there are given expression in speech through associa-

tion fibres, the speech centres and the centres controlling the peripheral muscles involved.

*Laryngeal Stenosis:* In chronic laryngeal stenosis, voice and speech are often severely affected, even after dilation of the larynx has been successful. In such cases the acquisition of adequate voice and speech may be greatly enhanced by the introduction of speech and voice training along with the dilatory treatments.

*Cancer:* When considering some of the other laryngeal involvements, one finds that in the presence of malignant conditions the laryngologist's auditory sense is especially important, for hoarseness often leads to early recognition and diagnosis of the condition.

*Hemangioma:* The vocal changes associated with a benign condition are decidedly different from those associated with cancer. The voice associated with a benign tumor does not have the wheezy quality that characterizes that in cases of a malignant growth. Although this voice is flat and raucous, with a coarse, heavy vibrato and little intonation, it does have intensity, which the voices in the cases of malignant growth lack.

*Tuberculosis:* Inflammatory conditions of the larynx, as everyone knows, are the most frequent cause of hoarseness. Acute and chronic laryngitis are the commonest of these conditions. Tuberculosis of the larynx is the next in order of prevalence. The most frequent site of the tuberculous lesion in the larynx is the posterior commissure.

*Hysterical Aphonia:* For purposes of contrast, the author considers a case in which the vocal condition was psychogenic. Although the loss of voice originally was due to an infection, it persisted long after the local condition had completely cleared up.

In conclusion, the author reiterates that the laryngologist should be able to differentiate between the various types of hoarseness. He should readily recognize in the voice of his patient the wheezy undertone that accompanies malignant conditions of the larynx, the breathy huskiness of tuberculosis or the characteristic vocal changes that accompany other conditions which continually come under the laryngologist's

observation. In other words, if he possesses a trained ear, he should, in many cases, be well on the road to a diagnosis as soon as he hears the patient speak.

Voorhees<sup>8</sup> sets down a few headings concerning defects in speech in relation to defects in hearing.

1. Anatomic defects are most often congenital, but some occur as the result of the effort to grow up and live in a world full of pitfalls for the struggler who would survive the "slings and arrows of outrageous fortune."

2. The severe colds of childhood, often misnamed "purulent rhinitis," take their toll of hearing, especially when super-induced by diseased tonsils and adenoids, the result of many attacks of "sore throat." In the presence of enlarged, infected adenoids, extension into the Eustachian tubes is the rule, with frequent earache, otitis media, mastoid infection or complications resulting therefrom.

3. Speech defects associated with loss of hearing for certain frequencies are common. The patients usually refer to themselves as "slightly hard-of-hearing." Any loss of hearing and speech in this classification calls for something more than merely medical care. There must be, in addition, a pedagogic approach to the problem, and, in the author's opinion, only teachers of speech who are qualified by training and experience should undertake the education of both hearing and speech.

4. Profound deafness in adults brings about changed quality of speech and intensity. Nerve deafness is always associated with a peculiar voice. Since the patient cannot hear his own voice, he either shouts or mumbles, and in either case it is difficult to understand him until one has become accustomed to his method of production.

According to Goldstein,<sup>9</sup> perfect speech is dependent on perfect hearing, correct speech production, understanding of pitch, volume and rhythm control and careful articulation.

It is a reasonable and logical observation that defective speech is often the result of imperfect hearing. Speech in its essence and performance is but an imitation of the sounds of the human voice as heard.

If more care and attention were given to the development of oral English for the benefit of the rising generation, the author ventures the thought that some of the less potent cultural elements that have been injected into the school curriculum could well be dispensed with.

He concludes with the thought that the problem is vital and that it is distinctly the province of the laryngologist to clarify the attitude of the parent, to emphasize proper surgical treatment in the individual case and to create a better understanding of the principles of preventive medicine.

In Moses<sup>10</sup> article concerning medical phonetics as an essential part of otorhinolaryngology, he states that the more exact methods of modern experimental phonetics, which before have been used only for linguistic purposes, will gradually find their way into the otologist's office. The movements of the larynx, of the palate and of the lips, as well as any air vibrations of voice and speech can be registered with the same exactness as the electrocardiogram records the auricular and ventricular activity of the heart.

It must be admitted that a great number of the nervous diseases mentioned do not, strictly speaking, belong to the otologist's field; however, these diseases reveal symptoms in the organs of his field which can only be detected by a thoroughly trained otologist. Parkinson's paralysis, for instance, affects the voice, and one can help to establish a diagnosis by recording the inaudible microscopic tremulous movements of the larynx. Specialists interested in constitutional problems will find that the human voice gives new evidence and furnishes new clues for certain constitutional types. To the different constitutional types (Sigaud, Kretschmer) are correlated different variations of voice. Thus, phonetics is able to spread the importance of otorhinolaryngology and may be considered its fruit-bearing branch.

#### SYMPTOMATOLOGY.

*Hoarseness:* Frank<sup>11</sup> defines hoarseness and gives a complete classification of the causes of same. Hoarseness is any alteration in the speaking voice which results in a roughness or rasping character to the voice. The causes follow:

1. Inflammatory (nonspecific).

- a.* Acute laryngitis.
- b.* Chronic laryngitis.
- c.* Abscess of larynx.
- d.* Perichondritis.
- e.* Membranous laryngitis (nondiphth.).
- f.* Fibrinous corditis.
- g.* Acute infectious laryngotracheitis.

2. Inflammatory (specific) laryngeal complications in specific infectious diseases.

- a.* Tuberculosis.
- b.* Syphilis.
- c.* Diphtheria.
- d.* Vincent's ulceromembranous laryngitis.
- e.* Influenza.
- f.* Measles.
- g.* Scarlet fever.
- h.* Blastomycosis and other fungi.
- i.* Typhoid fever.
- j.* Anthrax.
- k.* Leprosy.
- l.* Smallpox.
- m.* Rhinoscleroma.
- n.* Trichinosis.
- o.* Glanders.
- p.* Rabies.
- q.* Typhus.

3. Trauma.

- a.* External trauma with fracture of larynx.
- b.* Burns from radium and caustics.
- c.* Misuse of voice with cord hemorrhage.
- d.* Foreign body in larynx.
- e.* Dislocations of larynx.
- f.* Stab wounds and gunshot wounds.

4. Anomalies.

- a.* Laryngoptosis.
- b.* Acromegaly.
- c.* Congenital webs or cysts.
- d.* Ventricular prolapse.

- e.* Laryngocele.
- f.* Lateral cervical fistula.
- g.* Double vocal cords.
- 5. Allergy.
  - a.* Angioneurotic edema.
  - b.* Serum disease.
  - c.* Urticaria.
- 6. Metabolic — circulatory and blood diseases.
  - a.* Passive congestion in chronic nephritis, cardiac failure and cirrhosis of liver.
  - b.* Anemia.
  - c.* Agranulocytosis.
  - d.* Leukemias.
  - e.* Diabetes.
  - f.* Myxedema.
  - g.* Gout.
- 7. Associated with skin disorders.
  - a.* Pemphigus.
  - b.* Herpes.
  - c.* Lupus.
  - d.* Scleroderma.
  - e.* Erysipelas.
  - f.* Impetigo.
  - g.* Xanthoma.
  - h.* Lichen rubber planus.
- 8. Occupational diseases (industrial dusts and chemical inhalations).
  - a.* Stone, metal and wood.
  - b.* Sulphuric, nitric and picric acids.
  - c.* Gases in modern warfare.
  - d.* Intense heat and steam (cooks, stokers and firemen).
- 9. Benign tumors.
  - a.* Angioma, hematoma, fibroma, polyp, varis, teratoma, lipoma, chondroma, papilloma, lymphangioma, cysts, pachyderma, keratosis and nonspecific granuloma.
- 10. Malignant tumors.
  - a.* Carcinoma and sarcoma.



## 11. Neurogenic: A. Central lesions.

- a. Bulbar paralysis.
- b. Tumors of pons and medulla.
- c. Disseminated sclerosis.
- d. Syringomyelia.
- e. Tabes.
- f. Meningitis.
- g. Tetanus.
- h. Strychnine poisoning.
- i. Aneurysms of basilar and vertebral artery.
- j. Medullary syndromes involving nucleus ambiguus (Avellis, Tapia, Schmidt, Vernet, Jackson, Collet and Secard).

B. Peripheral (pressure or injury to recurrent or vagus nerve).

- a. Enlarged or substernal thyroid.
- b. After thyroid surgery.
- c. Tumors in neck, trachea or esophagus.
- d. Aneurysm of aorta or subclavian artery.
- e. Mediastinal glands or tumors.
- f. Pleural adhesions.
- g. Apical tuberculosis.
- h. Scoliosis of cervical vertebrae.
- i. Enlarged heart or pericardial effusions.
- j. Syndrome of jugular foramen (tumors or caries at base of skull or jugular thrombophlebitis).

## C. Peripheral neuritis (recurrent laryngeal).

- a. Alcohol.
- b. Lead.
- c. Tobacco.
- d. Arsenic.

## D. Other neurogenic causes.

- a. Spasm of larynx.
- b. Laryngismus stridulous.
- c. Tremor of larynx.
- d. Myasthenia laryngis.
- e. Hysterical aphonia.

## 12. Miscellaneous.

- a. Cricoarytenoid arthritis.
- b. Contact ulcer.

- c. General feebleness.
- d. Puberty changes.
- e. Aphthous ulcer.
- f. Drugs (potassium iodide, opium, belladonna and pilocarpine).

Wells<sup>12</sup> reports that, unlike general manifestations such as fever, pain, etc., which arise from many causes, hoarseness occurs only when one particular organ, the larynx, is affected, and its presence is a sure indication of laryngeal trouble. Furthermore, it is a symptom which must be accorded very special importance because it is often the sole one present, and that, too, in cases in which the disease is one of extreme gravity.

Here, the author briefly reviews the structure and function of the larynx, particularly as concerned in voice production.

As hoarseness is a form of dysphonia due to an alteration involving the vocal cords, this alteration can for the most part be readily made out by laryngoscopic examination.

Leaving aside a few very rare diseases, we may briefly consider the following conditions in which it chiefly occurs: 1. voice strain; 2. acute catarrhal laryngitis; 3. chronic catarrhal laryngitis; 4. acute edematous laryngitis; 5. acute spasmodic laryngitis (false croup); 6. diphtheria (true croup); 7. tuberculous diseases of the larynx; 8. syphilitic diseases of the larynx; 9. benign growths; 10. malignant growths.

*Voice Strain:* Hoarseness can develop as well from improper use as from excessive use of the voice. When it occurs suddenly after unusual exertion in the absence of other cause, we may justly say that it is due to strain.

Continuous improper use may not always be so evident, but should be suspected in those who complain of voice fatigue following singing exercises, or who speak in an unnatural cramped method, or who have poor resonance, and articulate indistinctly.

Objective changes are not always discoverable by the laryngoscopic examination. Violent strain may cause slight hemorrhages, usually shown as a red or later a brownish yellow spot on the cord. In a chronically strained voice, we

often note an elliptical space between the cords on abduction. This is due to paresis of the internal tensor muscle of the cord.

*Singer's Node:* A peculiar picture is sometimes seen in the larynx, consisting in the formation of small nodules on the edges of the vocal cords, which are directly traceable to improper use of the voice. They are small, rounded and uniform, partially translucent projections, often bilateral; found nearly always at the point of juncture of the anterior and middle third of the cord. They occur in singers who have been using improper methods; as for example, singing in a register beyond normal power and producing tones in a way usually referred to as squeezing the voice. They seldom occur in those who sing regularly in the low registers, but mostly in tenors and sopranos. They occur also in those who use the speaking voice badly and to excess, as teachers who teach in dusty rooms, public speakers who speak in the open, or individuals who are compelled to talk a great deal to deaf persons who do not use hearing aids.

*Pachydermia Laryngitis:* This is also a condition in which abuse of the voice is considered as a chief cause, for it is most often found in street hawkers, show barkers and auctioneers. It is marked by the heaping-up of the tissue at the posterior extremity of the glottis, in the interarytenoid space and on the vocal processes.

It is due to excessive proliferation of pavement epithelium and multiplication of papillae. A thickening of the one cord is often accompanied by a crater-like depression on the corresponding location of the other cord. These patients usually have a husky, deep voice, a disagreeable sensation and a constant desire to clear the throat.

*Laryngitis, Acute:* There are persons in whom every cold has a tendency to attack the larynx. The voice becomes husky, with a frequent desire to clear the throat, and sometimes slight tenderness in the region of the larynx.

*Laryngitis, Chronic:* Repeated attacks of acute laryngitis eventuate in the chronic form. In chronic laryngitis there is a tendency to colds, accompanied by hoarseness. The cords will appear dull red or dirty gray, sometimes thickened and covered by sticky secretions.

*Acute Edematous Laryngitis:* This is an acute inflammation of the larynx, attended with edematous swelling of the membrane. The swelling affects the epiglottis, arytenoid or aryepiglottic folds sometimes to an extent to render the anatomical landmark unrecognizable.

*Acute Spasmodic Laryngitis (False Croup):* This is a form of acute laryngitis peculiar to children. Laryngoscopy is not usually possible, but if it were, an edematous condition would be seen in the region below as well as above the cords.

*Diphtheria (True Croup):* When diphtheria involves the larynx, we have what is generally denominated true croup. The hoarseness and difficult breathing are due to the location of the pseudomembrane in the larynx. Although laryngoscopy is not generally used, it can be in a certain proportion of cases.

*Tuberculosis of the Larynx:* The question of whether or not laryngeal tuberculosis is ever primary we would leave to those who take delight in academical discussion: the important practical fact is that we do sometimes have it, and in outspoken form, in patients in whom the pulmonary lesion is slight or indiscoverable.

The laryngeal picture in an early stage may show nothing more than an abnormally pale mucous membrane, with perhaps a little swelling in the interarytenoid region. Later you will see evidence of infiltration of the arytenoids with papillary vegetation in the intervening area. When the ulcerative stage is reached, the cords will be involved and appear red and irregularly serrated.

*Syphilis of the Larynx:* Syphilitic lesions, known to appear in such various forms and in so many parts of the body, do not escape the larynx.

It is characteristic in general of syphilitic diseases of the larynx that it is relatively painless as compared with other serious conditions as, for example, tuberculosis or cancer.

*Benign Growth:* Several kinds of benign growths occur in the larynx which may be responsible for a persistent hoarseness. Papilloma is the most common form of benign growth,

especially in children in whom it develops to a size that will cause marked obstruction of breathing.

The benign growths, named in order of their frequency, are: fibromata, myxomata, lipomata, chondromata. Cysts also occur, located generally in the epiglottis.

*Cancer of the Larynx:* The importance of hoarseness as a symptom cannot be better exemplified than in its occurrence in cancer of the larynx, for in this serious disease it is sometimes, in the early stages, the only symptom present, and cancer is, of course, a disease in which early diagnosis is indeed of the utmost importance. It is much more common in men than in women, and it is on this account that persistent hoarseness in elderly men may be very significant.

*Laryngeal Paralysis:* We might naturally expect the voice to be affected in cases of paralysis of muscles which serve the purpose of phonation. If, however, there is a complete paralysis of the abductors affecting both cords, instead of hoarseness there will be aphonia, because the cords cannot be approximated in a way to produce vibrations.

Hoarseness may also be a symptom of a one-sided paralysis of the recurrent laryngeal nerve. Persistent hoarseness in persons beyond the age of 40 years should always arouse suspicion of the malignancy, at least if not due to evident mouth-breathing or excessive alcoholism.

Doctors need to be reminded repeatedly of the indications of symptoms.

The prognosis will naturally depend upon the underlying cause, and in the case of the grave infections or malignancies resolves itself into a question of the general as well as local extent to the disease.

When the hoarseness is the symptom of a self-limited acute disease such as acute laryngitis, we may expect to see it clear up as soon as the disease runs its course.

When the hoarseness is due to a growth of any kind which prevents normal approximation of the cords, the prognosis for the voice is bad if the condition is not corrected because of the extra strain put upon the laryngeal muscles in such case in the effort to overcome the handicap.

There is one kind of hoarseness that generally improves with time; that is, when it is due to vocal cord paralysis of one side; for after the paralyzed cord has finally settled down to a fixed position its immobility will be partially compensated by the overaction of the muscles of the other cord.

Finally, in certain cases, the cure or improvement in the hoarseness is of importance as an indication of recovery from the disease causing it. If hoarseness is due to a growth of any kind, it will never disappear until the growth has been in some way removed, either by direct or indirect laryngoscopy, or in the case of malignant diseases it may be removed by an external operation.

We hardly need emphasize the vital importance of early removal of any malignant or partially malignant neoplasms. This is particularly true in the case of the larynx, because of the very distressful nature of the later stages of malignancy in this situation.

Wells<sup>13</sup> states that hoarseness is a symptom in every case of some involvement of the larynx. It is often the only symptom present, even with an extremely serious laryngeal condition. The author discusses the conditions in which it chiefly occurs: voice strain, singer's node, pachydermia laryngis, acute and chronic catarrhal laryngitis, acute edematous laryngitis, acute spasmodic laryngitis (false croup), diphtheria (true croup), tuberculosis, syphilis, benign and malignant neoplasms and paralysis.

In a child who has hoarseness and difficult breathing, unassociated with a cold and of long duration, laryngeal polyps should be suspected. These are the most common benign growths in children and may develop rapidly.

In persons in the neighborhood of 20 to 30 years, if there is persistent or recurrent hoarseness, especially if the patient is anemic and has a chronic cough, tuberculosis should be thought of.

Persistent hoarseness in patients above the age of 40 years should suggest a malignant condition.

The mechanism of the larynx in causing hoarseness, the diagnosis of the various conditions and the treatment are

briefly discussed. Emphasis is placed on removal of causative factors, vocal rest and proper instruction as to how to use the voice without strain when the acute symptoms are gone.

Chronic hoarseness may be classified not as a clinical entity according to Damitz and Dill,<sup>14</sup> but as a symptom which designates interference or impairment of the normal function of phonation.

Hoarseness is neglected by patient and physician, which may be due to the fact that it so often accompanies and subsides with the common cold, or that the patient, as well as the physician, hopes the trouble will "clear up by tomorrow."

The author summarizes as follows: 1. In our series the occurrence of vocal cord paralysis and chronic nonspecific laryngitis were about equal and together accounted for 67 per cent of the cases.

2. There was an unusually close ratio, 41 to 25, of benign to malignant new growths.

3. Carcinoma and tuberculosis were about equal in their occurrence, the former being found in 25 patients, the latter occurring in 23.

4. Syphilis was found to be the etiology only once in 300 patients with chronic hoarseness. It is much more rare in our clinic than reports would indicate.

5. A small group of 2 per cent were classified as miscellaneous and included cases of psychoneuroses, myasthenia gravis, hysteria and psychopathic personality.

6. The group of patients in our series continued with their symptom of hoarseness for a varying but prolonged period before seeking relief, the average duration of which was as follows: Vocal cord paralysis (nonthyroid), two and one-half months; chronic nonspecific laryngitis, eight and one-half weeks; benign neoplasms, two years; malignant neoplasms, nine and one-half months; tuberculosis, two and one-third months.

In conclusion, the authors re-emphasize the extreme importance of further educating the public and the profession to the paramount significance of chronic hoarseness as a poten-



tially dangerous symptom. To the profession it is our duty to utilize every means available to reach an early diagnosis and institute treatment.

Bomskov and Sladovic<sup>15</sup> discuss investigations on the relationship between the thymus and the anterior lobe of the hypophysis. They obtained from the anterior lobe of the hypophysis of whales and of cattle 40 different fractions and assayed them biologically on guinea pigs, rats and pigeons for the five known hormones of the anterior pituitary; namely, the thyrotropic, gonadotropic, and lactotropic hormone, the growth hormone and the diabetogenic hormone. They were able to corroborate the results of other investigators with regards to the first four in proving them independent entities. They failed to differentiate the growth hormone from the diabetogenic hormone and concluded that the two are identical. They were able to prove that the growth or diabetogenic action of the hypophysis is a tropic hormone; that is, one which acts by way of affecting another gland, in this case the thymus.

The authors point out that all "tropic" hormones of the hypophysis are protein bodies but that nearly all the hormones formed in the organs that are under the hormonal control of the hypophysis are not proteins but sterols such as estrogen, progesterone, testosterone, corticosterone and so on.

The discovery of the thymus hormone found in the oil fraction of the thymus made it possible to study the action of thymus in animal experiment.

It was found that the thymus hormone increases growth, produces lymphocytosis, inhibits the development of the gonads and reduces the hepatic glycogen.

All these functions are characteristic for the infantile organism. The thymus of young animals was found to contain larger quantities of hormone than that of full grown animals.

Animal experiments demonstrated that the thymus hormone inhibits the action of the thyrotropic hormone of the anterior hypophysis and that neither the thymotropic nor the thymus hormone acts on the normal basal metabolism.

Effect which could be produced experimentally with the thymus hormone, namely, growth, lymphocytosis and inhibition of the development of the gonads, are also observed in status thymicolymphaticus.

Thymus death is an acute heart death, the result of glycogen deficiency of the cardiac muscle. Even small quantities of thymus hormone or of thymotropic hormone produce an extreme reduction in the glycogen content of the heart.

In order to determine the involvement of the thymus in other diseases, the authors developed a method which detects in the urine not only thymotropic but also thymus hormone. The predominant effect of both hormones is the mobilization of the carbohydrates. This mobilization differs from that effected by the thyroid in that it produces growth, whereas that of the thyroid produces energy.

According to Rehn,<sup>10</sup> thymus hormone, which during childhood and youth supports growth and is responsible for cell regeneration in adults, may lead to disease and death if its production is unchecked.

The mobilization of glycogen from the liver necessary for growth produces, if it goes beyond this need, the diabetes of childhood and complete depletion of glycogen of the liver and heart.

Periods of hormonal tension before, during and after puberty will lead to thymic disturbances more frequently than will other periods.

The author suggests that hyperfunction of the thymus during puberty is responsible for acromegaly and eunuchoidism. That hyperfunction of the thymus plays a part in exophthalmic goitre is proved by the frequent detection of an enlarged thymus in the presence of postoperative heart failure in these patients.

The author investigated the function of the thymus in ten cases of exophthalmic goitre. In some, the thyroid hormone may produce a secondary hyperfunction of the thymus. If early administration of iodine calms the thyroid in such cases, the irritation and hyperfunction of the thymus disappear. In other cases of exophthalmic goitre the hyperfunction of the thymus dominates the clinical picture.

Since the lymphatic system has an important part in the transmission of thymic secretion, it seems logical to investigate the behavior of the thymus in one of its most serious disorders, Hodgkin's disease. A severe if not inclusive involvement of the thymus in Hodgkin's disease is manifested by the extreme thymic hyperfunction, by the tremendous amount of hormone which produces a strong lymphatic stimulus and results in blastoma-like foci by the frequent development of Hodgkin's disease following hormonal tension of puberty, and by the favorable effect of mediastinal irradiations which in reality are irradiations of the thymus.

Treatment of hyperfunction of the thymus must aim at a decrease of the functional activity of the organ. The oldest method is surgical reduction, first carried out by Rhen in 1906. In cases in which the operation seems too dangerous, Roentgen irradiation is preferable. This type of treatment demands caution because dysfunction is likewise dangerous.

#### NONINFLAMMATORY DISEASES.

Angioneurotic edema has been described by Jackson<sup>17</sup> as a disease characterized by transient circumscribed edematous swellings on mucosal or epidermal surfaces, or on both. The larynx alone may be involved, but more commonly there are associated lesions in the gastrointestinal tract, esophagus, mouth, tongue, pharynx, lips, eyelids, skin or genitalia.

The author summarizes as follows: an unusual case of angioneurotic edema due to sensitivity to chicle is reported. The past history of nausea, dryness and vomiting when chewing gum; the present history of edema of the larynx, together with other manifestations of an allergic response; the strongly positive cutaneous reaction to chicle extract, with mild constitutional symptoms; the positive reaction to the passive transfer test, and the elimination of the other constituents of chewing gum, allow for little doubt that chicle was the offender.

Only two other cases of sensitivity to chicle have previously been reported in the literature, and in neither one was there laryngeal edema.

From a study of the customary treatment of neonatal asphyxia in 63 obstetric teaching centres of the United States

and Canada, Flagg<sup>18</sup> finds that carbon dioxide with oxygen is in general use, that aspiration is regarded as essential and that the use of heat is frequently overlooked. This should always be applied to protect the baby from exposure. When intracranial hemorrhage is suspected, lumbar puncture is advocated and the injection of whole blood into the buttocks is recommended. Mouth to mouth insufflation is commonly employed as a method of artificial respiration when mechanical facilities are not available. The use of blind intubation in accordance with the technique of de Lee is common practice in many clinics. The technique of direct laryngoscopy, intubation, suction and insufflation is not generally understood or applied when indicated. The baby that has shown signs of asphyxia should be carefully observed after it is returned to the nursery. The important question of atelectasis is raised and the need of research is indicated. There is a strong sentiment in favor of popularizing to the profession and the public certain general information relative to neonatal asphyxia, with special feeling that frequent sedation administered to the mother is responsible for much of the neonatal asphyxia which is encountered and that the elimination or the reduction of this routine sedation will do much to prevent asphyxia.

Hirsch<sup>19</sup> reports a case of suffocation caused by aspiration of a vomited piece of meat.

The question whether death was caused by aspiration of a foreign body in a state of alcoholic intoxication or by a previous cerebral syphilis or luetic leptomeningitis is discussed, and the conclusion is made that death in this case was due to alcoholism.

#### ACUTE INFLAMMATORY DISEASES.

Worden<sup>20</sup> points out that at the Alexandra Hospital for infectious diseases in Montreal it has been the routine to record on admission whether that patient had or had not been immunized to diphtheria. The 9,295 admissions to the hospital from 1932 to 1938, inclusive, were studied with reference to diphtheria immunization. The patients were suffering with scarlet fever, measles, diphtheria, whooping cough, parotitis, chicken pox and erysipelas. Of all the

patients less than 12 years of age who made up 80 per cent of the admissions admitted in 1932, 16.9 per cent had been immunized. This figure rose to 53.5 per cent in 1938. In 1938 only 9 per cent of all children less than 1 year of age and only 25 per cent of those less than 2 years of age had been immunized. In Montreal in 1933 there were 297 cases of diphtheria with 18 deaths, and in 1938 there were 227 cases and 26 deaths. Immunization of infants at the age of 6 months should be particularly encouraged and this should be followed by a further dose of toxoid at about 5 years of age.

Diphtheria does not occur among patients who have had a full immunization course. There have been four such cases at the Alexandra Hospital during the last three years. These cases probably fall into that group of children who after three or four years require "reimmunization" with a single dose of toxoid (from 0.25 to 1 cc.).

Murray<sup>21</sup> compared the results of the tellurite test for diphtheria with the bacteriologic results of an unselected consecutive series of pharyngeal exudates. Owing to the long distance separating many practitioners from laboratories in South Africa and the consequent delay in receiving laboratory confirmation of a diagnosis of diphtheria, the author felt that the test if its reliability was confirmed would be especially valuable under the conditions existing in South Africa. The results of the test in a series of 62 cases show 38 positive direct tellurite tests, but 11 (28.9 per cent) of these were neither bacteriologically nor clinically acceptable as cases of diphtheria. In 24 cases given a negative tellurite test, five (20.8 per cent) were definite cases of diphtheria. Putting the results in another way, 94.3 per cent of the diphtheria cases gave positive results; but, on the other hand, 36.6 per cent of nondiphtheritic cases also gave positive results. These results correspond closely to those obtained by Tombleson and Campbell, by Cooper and his associates and by Tynan (1939). With such a high percentage of error in each direction, it seems unlikely that the test is of any practical value. Reliance for the diagnosis of diphtheria in this area at least must continue to be placed on the clinical and bacteriologic observations. The varying reports made on results of the test in different series since Manzullo's publication would appear to bear out the percentage error. In Johannesburg, at least, it

has failed to provide any reliable assistance in the more speedy diagnosis of diphtheria.

Nevius and McGrath<sup>22</sup> compared the results of Schick tests on groups of school children five years after immunization with toxin-antitoxin and with alum-precipitated toxoid. Seventy-eight who had been given three 1 cc. doses of diphtheria toxin-antitoxin in 1932 and who had negative Schick reactions one year later were again given the Schick test in 1937, and 75, or 96 per cent, still reacted negatively. Of 72 children who were given 1 cc. of alum-precipitated toxoid in the fall of 1933 and had negative Schick reactions in 1934, only 58 children, or 80 per cent, still reacted negatively in the fall of 1938. It appears that, while alum-precipitated toxoid produces a prompt negative Schick reaction in a high percentage of cases, the result is transient and disappears after five years in about 20 per cent of children. The study bears out the general belief that the immunity from a single dose of 1 cc. of alum-precipitated toxoid does not last as long as that from the older preparations. This should encourage the use not of the older toxin-antitoxin preparations but of two 1 cc. doses of alum-precipitated toxoid two or three weeks apart and Schick retesting of the children at regular intervals. Since the ideal time for immunization of the infant is when he is between 6 and 9 months of age, Schick tests should be done at the ages of 12 months, 3 years and 5 years, or just before the child enters school. In the event that the reaction becomes positive, another 1 cc. dose of toxoid should be given, with subsequent retesting.

According to the seventeenth annual report, diphtheria mortality in large cities of the United States in 1939 indicates that intensive protection programs are being carried on in many parts of the country. The family physician continues to become a more important part of the program and is giving more protective treatments in his own office. The evidence continues to indicate that the protection programs so extensively maintained are resulting in a very definite lower death rate from diphtheria.

Richards<sup>23</sup> states that the primary and most efficacious form of treatment of simple acute laryngitis is absolute and complete vocal rest. Patients, if possible, should not be per-

mitted to even whisper for at least three to five days. The frequently associated tracheitis is best controlled with an appropriate cough medicine containing such hypnotics as codeine or morphine, by inhalation of steam medicated by compound tincture of benzoin, and particularly by the intra-tracheal instillation of soothing, oily medications such as pinoleum or the more complex monochlorophenol. Such medications can, under guidance of the laryngeal mirror, with frequent necessary preliminary cocaineization, be instilled with a laryngeal syringe directly onto and between the vocal cords during deep inspiration. I believe that this local treatment, carried out daily for two or three days, can be supplemented by the use at home of an infrared lamp and also by applications applied about the neck of cotton sheet wadding saturated with isotonic salt solution. Of chief importance is the recognition of obstruction before it becomes so serious as to constitute an emergency. Diphtheria would, of course, be suspected in the presence of any diphtheritic membrane elsewhere in the throat, but absence of the latter does not rule out laryngeal diphtheria, and with any evidence to suspect contagion, antitoxin would wisely be administered.

Persistence of obstruction, however, must always give rise to the suspicion of some more serious underlying cause such as the disease now commonly known as laryngotracheobronchitis. Any suspicion of the existence of this disease or even a simulating condition, such, for instance, as foreign body in the larynx or true streptococcic laryngitis, would warrant immediate transfer of the patient to a hospital, where direct laryngoscopic examination could at once be carried out.

An obvious foreign body can be removed in the manner best adapted to its nature and, in the case of laryngotracheobronchitis, a decision can be made after direct examination of the larynx as to the desirability of tracheotomy. In spite of the immediate relief afforded by it, intubation as a general rule is not satisfactory in laryngotracheobronchitis and its employment will only lead to further difficulty later on. The value of sulfanilamide or sulfapyridine has not yet been clearly established in these more severe forms of laryngeal infection.

Williams<sup>24</sup> points out that the mortality in 31 recent cases that he collected from five local hospitals was 54 per cent.



Such a rate suggests that the disease does not receive proper recognition and treatment. In Ludwig's angina, a massive swelling, often bilateral, always brawny and tender but rarely fluctuant, involves the suprahyoid region, being extreme in the submaxillary area. The overlying skin is conspicuously free of inflammation, showing only edema. The floor of the mouth is raised, edematous and brawny. The mucous membrane beneath the tongue is often ulcerated and dirty grayish white. The tongue is swollen and pushed upward, and it may become so crowded by sublingual edema that its tip protrudes between the teeth. Respiratory obstructions, due to blockage of the airways by an elevated or edematous tongue, is frequent. Emergency tracheotomy was performed on eight of 31 patients in this study. Four patients on whom tracheotomy was not done died of asphyxia. Bronchopneumonia complicated eight cases, seven of which terminated fatally. Extension of the infection took place in eight cases, seven of which were fatal. The aims of treatment are to establish an airway, to relieve tension, to secure drainage and to combat the infection through supplementary measures. Tracheotomy is the most dependable means of securing an adequate airway. The tracheotomy incision should commence just forward, parallel to and about 1 cm. below the body of the mandible, until it reaches the midline anteriorly. It should divide the deep cervical fascia, the mylohyoid diaphragm and the anterior belly of the digastric muscle penetrating upward so that the tongue and the mucous membrane of the floor of the mouth may be explored. Such an incision lessens tension and improves the airway. The choice of anesthesia warrants deliberation. At the Boston City Hospital, pentothal was used in four and evipal in two cases of Ludwig's angina of the present series. Pentothal sodium is offered as a suggestion, which future experience may or may not substantiate. Its use must be restricted to those familiar with the administration of pentothal. Sulfanilamide is of great value in cases showing positive streptococcus hemolyticus cultures. Zinc peroxide is indicated when anerobic organisms are present.

In referring to Ludwig's angina, retropharyngeal abscess and other deep abscesses of the head and neck, Grodinsky<sup>25</sup> states as follows:

1. The early recognition and proper management of Ludwig's angina, retropharyngeal abscess and other deep abscesses of the head and neck call for thorough knowledge of the anatomy of the regions concerned, as well as for adequate surgical judgment and skill.

2. The seriousness of these conditions lies in their tendency to spread along fascial planes and invade the thorax with the production of mediastinitis.

3. A study of the fasciae and fascial spaces of the head, neck and adjacent regions was made. This was based on dissection, injection and section of 95 adult cadavers and five full-term fetuses.

4. The spaces involved in Ludwig's angina, retropharyngeal abscess and other deep abscesses were observed and the possibilities of spread noted.

5. The location of surgical incisions for drainage of these abscesses, based on the spaces involved, were determined.

Some time ago, Miller,<sup>26</sup> in wishing information on edema of the larynx, was surprised to find that textbooks passed over the subject with scant attention and that the information which he wished was not readily available. He, therefore, decided to make his own investigation and he has recorded the historical and experimental findings as follows:

While experiments on the cadaver cannot exactly reproduce what occurs in the living subject, they can undoubtedly give a rather accurate idea of the extent to which edema of the larynx may extend. They seem to indicate that edema may be localized between two adjacent condensations of fibrous tissue, represented by the barriers which have been pointed out. Certain chemical or physiologic effects of the fluids may develop in these tissues in disease which might lessen the efficiency of these condensations as barriers to the spread of involvement, as compared with their efficiency in checking the spread of the fluid in these injections. Certain types of edematous fluid may spread more rapidly than others because a difference in the protein content affects the diffusibility. Various factors such as these make it difficult to evaluate clearly the clinical importance of these particular findings.

The results indicate, too, that with infections of the tonsil or the lateral pharyngeal wall when edema arises it may extend downward into the pyriform sinus and from there extend into the aryepiglottic fold. Edema of one aryepiglottic fold might cause some respiratory difficulty but would not cause asphyxia; however, if both should become involved the situation would become acute. It appears that in mild conditions the fold only would be invaded, but it seems sure that if there was much swelling of the structure the fluid would almost certainly have to extend down over the esophageal surface of the cricoid and also invade the deeper tissues on the interior of the larynx. If this involved only one side there would still be breathing space, but if both were involved there would be asphyxia.

The findings seem to emphasize the need for careful watching in any case in which edema has developed or may develop, as the fluid may travel fast and far, and when there is swelling of the upper structures one cannot see how rapidly the obstruction is developing below. One should always be prepared for emergency tracheotomy at the first sign of acute asphyxia.

Waldapfel<sup>27</sup> reports that tracheotomy is one of the oldest and most important of the surgical procedures and belongs to the general category of neck operations. It is not limited to any one specialty and should be mastered by the laryngologist, surgeon and general practitioner. In spite of its being an old operation, failures still occur during the course of the operation and in the after-treatment. Some of these are due to the method of opening the trachea itself.

The resection thus is performed simply in the following way:

After exposure of the trachea the membranous annular ligament between the second and third tracheal rings is split transversely, the disc of the instrument is introduced into the slit, and the instrument is closed as is a conductor's punch. It is removed and the excised piece of tracheal wall is contained therein. By the opening thus produced, the tube is passed easily into the trachea. The entire procedure could not be simpler.

It is the purpose of this discussion to present a method of performing tracheotomy which has proved satisfactory and which avoids a number of rather untoward consequences. He believes the method can be recommended wholeheartedly.

Pallestrini<sup>28</sup> advocates the use of a transverse incision in the soft tissues in tracheotomy, especially in cases in which the trachea is compressed or dislocated by an extratracheal growth or in which the operation is performed as a preliminary to external operations on the larynx or pharynx. In his experience in many cases, the cutaneous wound has always healed by first intention, because the pocketing that occurs at the lower end of the wound in the classic operation is avoided and, hence, soiling by tracheal secretions does not occur. By this method, retraction of the isthmus of the thyroid gland without injury is facilitated; high tracheotomy is possible; tissues which must be invaded in a secondary operation are not disturbed; closure of the tracheal wound after need for the tube is over is rapid, and the superficial scar is almost invisible.

Mennito-Ippolito<sup>29</sup> states that investigation has been made into the cardiac behavior of 11 children who had worn a tracheotomy tube for periods varying from seven days to four years. The latter had worn his tube from the age of 7 years to that of 11 years. Of the remaining children, three were 8 years of age, one was 7 years, four were 6 years and three were 5 years. All the children had undergone tracheotomy on account of laryngeal diphtheria. It was felt that the prolonged subjection to respiration through an abnormal airway might have some effect on the heart and on the chest.

In eight cases there was nothing of importance to record, but in the remaining three there was an accentuation of the second sound over the pulmonary artery in one, an impure first sound over the aorta in the second, and a slight hemic souffle in the third. A fourth child had shown signs of fibrillation of the auricle but this was not confirmed by electrocardiography.

There were no changes in the chest as examined by radiography—certainly no thorax was larger than would be expected in a normal child of the same age.

*Complications of Tracheotomy:* In reporting on complications of tracheotomy, Clerf<sup>20</sup> states that subcutaneous emphysema of varying degree occurred in a number of the patients, which was limited to the neck usually and cleared up promptly. Mediastinal emphysema following tracheotomy developed in two cases; one, age 19 months, with a fragment of bone in a bronchus; the other, age 22 months, with a tooth in the bronchus. There was a brief interval between the bronchoscopy and the development of obstructive laryngeal dyspnea, and the emphysema did not develop until after the tracheotomy. Therefore, it was the opinion that air entered the mediastinum from the tracheal opening. Both cases terminated fatally. In no patient did cellulitis of the neck develop. The tracheotomy wounds were allowed to remain unsutured and this undoubtedly accounted for the absence of serious infection. No unusual difficulties were encountered with decannulation.

The author summarizes as follows:

Dyspnea occurred more often and tracheotomy was required more frequently in foreign bodies of vegetal origin.

Subcutaneous emphysema of the neck was observed not infrequently following tracheotomy. Subcutaneous and mediastinal emphysema may develop, however, before instrumentation or operation.

Imperatori,<sup>21</sup> in reporting on a case of hygroma cysticum, states that a swelling suddenly developed in the neck of a baby, age 7 months, and enlarged so rapidly within a few days that cyanosis developed. In order to breathe, the child automatically assumed the position of extreme extension. A Roentgenogram showed a large mass located in the lower part of the neck, extending from the clavicles to the jaw and laterally on either side of the sternocleidomastoid muscles. The trachea was displaced far to the right, so that it was considerably beyond the midline. There was also an atelectasis of the upper lobe of the left lung.

Aspiration demonstrated a bloody fluid that did not coagulate. Approximately 120 cc. of fluid was removed, and 3 cc. of a solution consisting of 0.75 per cent diathane hydrochloride (piperidinopropanedioldiphenylurethane hydrochloride),

5.5 per cent quinine hydrochloride and 3 per cent ethyl carbamate (urethane) was injected.

Roentgenograms taken after the injection showed that the trachea had returned to a more nearly midline position and the atelectasis had disappeared.

No recurrence has occurred after three months, and the child remains well. A subsequent report will be made on this patient relating to treatment and condition.

The author goes on to state that he saw a picture of this condition in Homans' Textbook of Surgery (Ed. 5, Springfield, Ill., Charles C. Thomas, publisher, 1940), which was published after he saw this child, and in a picture of his patient there was a mass which had localized directly over the clavicle. The mass in the child he saw was mostly on the right side, coming toward the left but extending over the central part of the neck. The reason for using the fluid which was used was that on reading the *Transactions of the American Laryngological Society for 1935 (Trans. Am. Laryngol. Assn., 57:39:52, 1935)* he found that a sclerosing solution had been used in the various hygromas that had been discussed over many years, and particularly recently by Dr. Carmody, who recommended a modified Carnoy's fluid, which consists of acetic acid, ferric chloride, chloroform and alcohol. This would seem to be a rather severe sclerosing fluid for use in a child, so I asked the urologists for something a little milder, and they recommended the solution they were using at the time in the treatment of hydrocele. Their object was to decrease the secreting epithelium, and this was practically the same effect the author had under consideration. The diathane acts as an anesthetic and the quinine acts as a mild sclerosing agent. The ethyl carbamate has a peculiar action on the endothelium — and this is rather theoretic — which permits the penetration of the quinine.

Orton<sup>32</sup> also reported a case of massive cystic hydroma in a child, age 6 weeks, in which he operated both sides of the neck, doing an extensive dissection of the cyst from all vessels of the neck.

According to MacCready,<sup>33</sup> acute laryngotracheobronchitis is an acute infection of the upper respiratory tract which occurs sporadically during the course of influenza. It varies

from year to year, depending on the prevalence of the so-called secondary invaders. While it can occur in adults, it occurs predominately in children, due to lesser immunity, and especially in very young children, where anatomical factors play a rôle. It is characterized by high fever, toxemia and an intense inflammatory change in the mucous membrane and walls of the larynx, trachea, bronchi, and usually the bronchioles. These changes tend to produce obstruction to respiration and at any moment death may result from acute edema or the larynx or, more commonly, from subglottic edema. While treatment has become clarified, no startling advances have been made and a successful recovery is still to be looked on as an accident rather than the result of excellent care. The only rival advance which seems to have been made is that when these children are put on constant steam inhalations very early, it may aid in preventing the more fulminating phase of the disease. Even this cannot be accurately concluded from this year's experience, since we are dealing with a condition which, while much more prevalent this year, is not as severe as has occurred in the past.

Orton,<sup>34</sup> in analyzing 62 cases of acute laryngotracheobronchitis, with autopsy findings, reports as follows:

1. Acute laryngotracheobronchitis in young children is a very important problem both for the general practitioner and the pediatrician.
2. Proper handling of these cases requires early recognition for what they are, and that valuable time should not be lost in treating them with antitoxin when signs of obstructive dyspnea make their appearance.
3. Immediately upon the suspicion of the diagnosis, the patient should be transferred to a hospital where direct laryngoscopy and bronchoscopy can be carried out at once and where more active treatment, such as intubation and tracheotomy, may be done at a moment's notice, with an especially trained personnel always immediately available.
4. If time permits, Roentgen ray study should be made prior to operation, otherwise it should be done immediately following the tracheotomy.
5. Intubation should be done only for immediate relief; this should be followed by tracheotomy.



6. Patients should be placed in a room supersaturated with moisture at a temperature of 70° at all times — this temperature and high humidity is more comfortable to the patient than the old-fashioned hot croup-tent.

7. The humidity in a tent can be raised to 95° when the room temperature is 70° by the use of a mechanical humidifier.

8. The temperature and humidity of an oxygen tent have more effect on the comfort of the average patient than does the oxygen concentration.

9. Water loss from the body can be decreased by increasing the humidity if the air temperature is not above 70°.

10. Tracheotomy is the operation par excellence.

Conclusions formed by Galloway<sup>35</sup> in connection with laryngotracheobronchial obstructions and their secondary effects are:

1. In laryngeal obstruction, relief of asphyxia is the most immediate problem.

2. Persisting obstruction leads to marked changes secondary to increased negative intrathoracic pressure.

3. These are congestion, edema, exudate or hemorrhage, atelectasis and emphysema.

4. Superimposed infection may lead to atypical pneumonia, pneumonitis, lung abscess or bronchiectasis.

5. Intervention must not be delayed until these irreversible changes are established.

6. Postural drainage and irrigation are valuable aids after tracheotomy.

Wilson<sup>36</sup> believes that we see abscess of the larynx and papilloma of the larynx because they are mistaken for diphtheritic croup in the absence of a direct examination of the larynx. In measles, sometimes an eruption is present in the larynx. In diphtheria, we have a swelling in the larynx with the presence of a membrane.

*Laryngotracheobronchitis:* The author describes the laryngeal obstruction as supraglottic and subglottic, by which we mean that the obstruction is above or below the cords. In

laryngotracheobronchitis, cyanosis is not common because the obstruction does not occur suddenly or completely, but is slow in development and incomplete.

Sudden death occurs following tracheotomy, both in adults and in children, by the sudden dilution of the residual carbon dioxide in the lung by the inrush of air. The remedy is the administration of carbon dioxide and oxygen, and this should be on hand and ready for use alongside of the operating table. It is best to administer carbon dioxide and oxygen to the patient as a routine immediately following a tracheotomy, because if one waits for symptoms, the patient has already ceased breathing from lack of carbon dioxide and it is then difficult, if not impossible, to get sufficient carbon dioxide to the respiratory centre in time to revive him.

*Complications of Tracheotomy:* Hemorrhage: The author states that he has never seen a primary hemorrhage, but he has seen one or two cases of secondary hemorrhage during the second or third week as a consequence of deep infection.

Mediastinitis is rare and usually terminates in hemorrhage from erosion of one of the larger vessels.

*Emphysema and Pneumothorax:* This is common, occurring in about 75 per cent of the cases; when pneumothorax occurs on both sides, it is exceedingly dangerous. It may occur spontaneously, with or without a tracheotomy.

In a report on acute infective laryngotracheobronchitis, Felts<sup>37</sup> states the usual medical treatment was carried out. Sulfanilamide was given to three, and diphtheria antitoxin to six. Only two cases, the mildest of the group, did not require tracheotomy. Of the 17 who were tracheotomized, three were previously intubated but the airway found to be insufficient.

Complications were present in six cases, acute suppurative otitis media in four, bronchopneumonia in two, and acute cervical adenitis in one.

Fifteen patients recovered, with an average stay in the hospital of 11.9 days, and four expired, making a mortality rate of 21 per cent. Of those who expired, one was an infant, age 14 months, who had a "measles-like" rash and suppurative otitis media one week before obstructive symptoms, and difficulty in breathing one week before admission to the hos-

pital. Bronchopneumonia was terminal. Another, an infant, age 16 months, had respiratory difficulty 10 days before admission to the hospital, was bronchoscoped immediately and appeared to be relieved, then suddenly expired about an hour later, emergency tracheotomy being of no avail. The third infant, age 3 months, had dyspnea five days before entering the hospital. X-ray revealed a slight enlargement of the thymus, and complications were asthma and impetigo. Death occurred on the thirtieth hospital day, and autopsy revealed red and swollen mucous membranes of the larynx and trachea, covered with a thin sticky secretion like varnish. The fourth baby, age 14 months, had dyspnea four days before admission to the hospital. On admission, there was marked dyspnea, cyanosis and extreme restlessness. Bronchoscopy revealed the usual picture in acute infective laryngotracheobronchitis, and X-ray revealed considerable enlargement of the thymus. Death ended on the ninth hospital day with cyanosis and rapid shallow respiration.

Vital factors necessary for reduction of mortality, according to Davison,<sup>28</sup> are: 1. early recognition of this disease by the family physician; and 2. constant care in a properly equipped hospital.

Treatment resolves itself into two major divisions: 1. maintenance of the airway; and 2. supportive treatment until the natural defense mechanism has been able to kill the invading organisms.

Removal of gummy tracheal secretions and crusts by aspiration through a direct laryngoscope is certainly indicated for those patients who have obstruction due to these causes.

A tracheotomy delayed until after the development of pneumonia will restore the airway but will not remove the pneumonia. The author thinks that if the rhonchi persist, tracheotomy is indicated to afford drainage, even though subglottic swelling is not sufficiently marked to make one feel that tracheotomy is essential to relieve the dyspnea.

One argument offered by those who advocate intubation rather than tracheotomy has been the fact that crusting tends to occur after tracheotomy because the inspired air has not been moistened by passage through the nose. Davison and his

coworker have been able to overcome this difficulty by the use of a well humidified oxygen tent. All authors agree that high humidity is desirable. The temperature of the air surrounding the patient is also worth considering. In the past, we used a steam-humidified croup tent. This produced a temperature of 90° or 95° F. and made the children uncomfortable and anxious to get out of the tent. The cool air of an oxygen tent has been advised as one means of reducing the subglottic edema occasionally resulting from the use of the bronchoscope in treating very young children.

High fluid intake is another therapeutic factor emphasized by all authors.

Chemotherapy naturally suggests itself. In the cases encountered in the clinic in which streptococcus hemolyticus was the infecting organism, the bacteriostatic effect of sulfanilamide seemed to lessen the severity and shorten the course of the disease.

The author concludes as follows:

Direct laryngoscopy is essential for accurate diagnosis.

Sulfanilamide is of therapeutic benefit when streptococcus hemolyticus is the infecting organism.

Subglottic edema is less marked if the patient is kept in cool moist air rather than in warm moist air.

The use of atropine and of sedatives is contraindicated in the treatment of this disease.

The development of pneumonia can usually be prevented if treatment is begun early and if the bronchi are at all times kept patent by removal of secretions and obstructing crusts.

Bronchoscopic equipment is essential for the management of patients with this disease.

Tracheotomy rather than intubation is indicated when obstructive symptoms become marked.

The mortality for this series of 17 cases was 11.7 per cent.

Regarding observations on the control of temperature and humidity in oxygen tents, Davison<sup>20</sup> became interested in this problem while trying to determine what are the ideal climatic

conditions for the treatment of children who have acute laryngotracheobronchitis. All authors agree that very high humidity is desirable in order to keep the tracheobronchial secretions as fluid as possible, but little has been said about the optimum temperature. The problem is one essentially of air conditioning, not for normal individuals but for patients who require special climatic conditions. These thoughts naturally led me to literature on the subject of air conditioning.

The author concludes as follows:

1. The temperature and humidity of an oxygen tent have more effect on the comfort of the average patient than does the oxygen concentration.

2. A wet and dry bulb thermometer should be part of the equipment of every oxygen tent.

3. Temperatures of 68° and 70° are usually the most comfortable when humidity is high.

4. Humidity in a tent can be raised to 95 per cent when the temperature is 70° by the use of a mechanical humidifier.

5. An ice-cooled oxygen tent with a motor is a useful, practical means of increasing heat loss from the body.

6. Water loss from the body can be decreased by increasing the humidity if the air temperature is not above 70°.

Brighton<sup>40</sup> states that the treatment of laryngotracheobronchitis has been made very difficult because the diagnosis depends to a large extent on the condition of the larynx and tracheal mucosa after the disease has become established. If one were to diagnose all cases of laryngeal dyspnea as laryngotracheobronchitis, the number of cases in the literature would increase tremendously. For his purpose in diagnosing this condition, the author has limited his diagnosis of laryngotracheobronchitis only to those cases in which the obstructive laryngeal dyspnea was sufficient to warrant tracheotomy.

Except for a more or less marked congestion and edema, the lungs appeared entirely normal in most of our cases. In a very few, a yellowish exudate between the chest wall in either or both lungs and foci of consolidation and necrosis of a yellowish color were present.

The individual variation in the findings is great, depending upon the length and severity of the process. Secondary invading bacteria may lead to a partial or diffuse necrosis of the tracheal wall and complicate the picture. Cocci and, more frequently, diphtheroids, probably similar to those described by Graham and his coworkers, are present in such cases. In general, however, such bacteria seem to play a minor rôle. Rickettsias have not been found.

These lesions in the lungs and bronchi seem to be more extensive in the spontaneous disease than when it is artificially produced. In a few cases a true pneumonia is present in the tissue surrounding the affected bronchi. In addition, more profuse hemorrhages and larger foci of necrosis are found in the lung parenchyma, often walled off by fibroblasts. In many cases numerous foreign body giant cells are found among the fibroblasts.

#### NEUROSES.

Adams<sup>41</sup> reviewed the literature of laryngeal vertigo and concluded the condition is not a definite clinical entity. It is found in association with many different conditions, and coughing of any origin may be the causal factor. Most modern writers are willing to accept as examples of "laryngeal vertigo" any case in which coughing is followed by temporary loss of consciousness.

Babbitt<sup>42</sup> reports a case of laryngeal epilepsy. The patient was referred to him for treatment of an irritated, inflamed throat and chronic laryngitis following an attack of grip. The hoarseness varied in degree but the throat was sore at all times, and there were an associated stuffiness of the Eustachian tubes and some pain in the right ear. The patient reported that attacks like this had occurred before, but never were so long in clearing up. He also had active acne rosacea. The examination showed that the patient had an irregular deviation of the septum, blocking both sides of the nose and making catheterization difficult. The faucial tonsils were rather small and were injected, with evident areas of cryptic secretion. On transillumination the frontal and maxillary antrums appeared clear. The tympanic membranes, though somewhat dulled, appeared normal.

The larynx was difficult to examine as the right margin of the epiglottis had collapsed vertically, but the cords were clearly injected and thickened. In the course of the examination a pillar retractor was used to draw back the anterior pillar of the left tonsil and express cryptic exudate from the upper pole; semipurulent material appeared with this exudate. When this was done, the patient suddenly became cyanotic, with tremor of the body, twitching of the hands and a definite laryngeal spasm. When he resumed consciousness, there was an expectoration of much frothy mucus. Fortunately, the author's assistant, Dr. Silcox, observed this with him and can authenticate the details. This was a typical epileptiform spasm, scarcely lasting even a minute, but its unusual character was striking. The history showed two definite attacks prior to this of the same character, one occurring six years before, after a vacation adventure in the mountains, when the party was gathered for simple refreshments, and a second one following a crabmeat dinner three years ago, when the patient was taken from the table unconscious, and this state was reported to have lasted half an hour. The patient reported two or three minor occurrences of the same sort when he was alone. The patient was referred to Dr. Tucker for examination and consultation. After the first examination, Dr. Tucker gave the following report:

"Mirror examination shows distinct thickening on both cords throughout the posterior third in front of the vocal processes. The thickening extends subglottic and seems to be in the nature of an infiltration, probably inflammatory. There is no indication for biopsy at this time."

As the patient had much postnasal mucus and threw back considerable fluid from the laryngeal area on examination, Roentgen ray studies were made of the sinuses and for evidence of esophageal diverticulum. The following reports were made:

"The examination of the sinuses shows extensive development of the sphenoid and ethmoid cells and slightly less extensive development of the frontal sinuses and antrums. Nowhere is there any density sufficient to suggest pathologic involvement. Individual ethmoid cells on both sides are large, and two aberrant cells extend upward into the frontal region



and are separated from the frontal sinuses by distinct septums. The nasal septum is slightly deflected toward the left. There seems to be excellent aeration throughout both nares, with apparently no hypertrophy of the turbinates.

"In both the upright and the semioblique prone position no obstruction to the flow of barium sulfate throughout the entire esophagus can be seen. Nowhere is there any sign of a diverticulum; however, on one of the Roentgenograms rather large epiglottic valliculae are shown just anterior to and above the epiglottis, which is completely filled with barium and is somewhat larger than normal but should not be considered a true diverticulum. There is otherwise no abnormality."

After considerable study for safeguarding the operation, there seemed to be two contributing factors: one was the marked nasal block of the cartilaginous septum, and the other was the exquisite tenderness and injection of the tonsils, particularly the left one. Manipulation of either area caused considerable laryngeal spasm. The tonsils were removed and an abscess cavity in the posterior portion and involving part of the upper pole of the left tonsil was found, perhaps 3 cm. in diameter. The operation was done under local anesthesia and was handled well by the patient. Culture of material from the removed tonsils showed hemolytic streptococci. Convalescence from the operation was uneventful, and the patient has had no further attacks resembling epilepsy since the tonsils were removed, which indicates the importance of that focus.

A bibliography of some 20 references on this subject has been prepared and is at the service of anyone who is interested in further investigation.

Jackson,<sup>43</sup> in reporting on myasthenia laryngis, states:

Myasthenia laryngis is a morbid entity entirely independent of chronic laryngitis, which may or may not be concurrent. It is a muscular disability as distinguished from a mucosal inflammation.

There seems to be a failure on the part of laryngologic writers to recognize muscular asthenia as the fundamental condition in hoarseness and vocal impairment of singers, clergymen, evangelists, public speakers, incessant conversa-

tionalists and other abusers of the voice. Most writers consider only chronic mucosal inflammation in such cases.

In clinical work, in a large proportion of the cases of chronic hoarseness associated with vocal abuse and supposed to be due to chronic laryngitis, the condition is really a muscular disability, involving most severely the thyroarytenoideus muscles. Failure to recognize this fundamental fact explains the frequent disappointment in the treatment of chronic hoarseness.

The larynx, with its controllable supraglottic and infraglottic air column, constitutes an air column instrument closely analogous to the cornet, and a study of this instrument sheds important light on the subject of the laryngeal phonatory mechanism.

Every one of these actions has an analogy in laryngeal phonation. Observation with the mirror and palpation of the neck, analyzed in the light of his studies of the phonetic mechanism of the cornet, have convinced the author that the laryngeal phonatory mechanism consists in contraction of an orbicular group of muscles preceded and opposed by a guying group of divergent muscles.

In developing phonation, Nature seems simply to have made use of the phylogenetically earliest primary valvular mud-excluding laryngeal function, using the opening and the closing mechanisms in opposition to each other.

The studies mentioned here show that myasthenia laryngis is the result of overworked thyroarytenoideus muscles and that this fact is fundamental to diagnosis, prophylaxis and treatment of chronic hoarseness.

About 95 per cent of the aspirants for a career in vocal music are compelled to give up because of myasthenia laryngis. The damage is usually done by the training necessary to increase the range upward.

Froeschels<sup>44</sup> believes that there are two main inter-related points in connection with psychology of the laryngeal functions:

1. With the help of Weiss' experiments, the fact that there are conscious kinesthetic sensations of the so-called finer functions of the vocal cords has been demonstrated.

2. From this fact, the existence of analogous sensations under abnormal anatomic conditions may be inferred.

It is now suitable to inquire what the practical import of these conclusions may be. The answer is threefold:

1. A reliable scientific basis has been furnished for the practice of those empiricists who consider the development of specific muscle sensations as one of the main objects in vocal training. Presumably, this training is intended to develop sensations not only of the respiratory mechanism of the mouth and pharynx and of certain extrinsic muscles of the throat but also of those muscles which control the vibrations of the vocal cords.

2. The possible effects of a well founded scientific fact on future research can never be foreseen; aside from its effects, the fact is of importance in itself.

3. It is significant to be able to demonstrate that there are conscious factors in certain functions which were hitherto considered as belonging entirely to the problematic realm of the unconscious.

#### LARYNGEAL ABSCESS.

According to Brown,<sup>45</sup> acute inflammatory disease of the epiglottis is a clinical entity which is encountered rather infrequently. There are several types which will be described.

The literature on abscesses and acute inflammations of the epiglottis is difficult to analyze because of the fact that many cases are recorded under the classification of "abscess of the larynx." In studying the case reports in most articles on laryngeal abscess, it becomes readily apparent that considerably more than one-half of all such abscesses are epiglottidean.

In the author's review of literature he finds that:

1. The epiglottis may be the site of localized infection or of abscess formation without involvement of the adjacent pharynx or larynx.

2. Such infections may be primary due to trauma, or secondary to adjacent infection.

3. Such infections of the epiglottis have their own peculiar and fairly constant symptoms and findings.

4. In my experience, an abscess may occur as readily on the laryngeal as on the lingual surface, a fact substantiated by recent histologic study.

5. If the foregoing facts are realized, earlier diagnosis and proper treatment may be employed to prevent serious complications.

#### CHRONIC LARYNGITIS.

Putney and Clerf<sup>46</sup> state that chronic hypertrophic laryngitis occurs often as a result of abuse or misuse of the larynx. Constant trauma, especially in the presence of infection, produces permanent changes in the tissues. The result of this process may take the form of a localized area of inflammation or involvement of the entire membranous cord.

The etiologic factor would seem to be trauma to the cords by habitual misuse of the larynx, by repeated acute infection or by a combination of these. In our series of eight cases, one or both of these conditions were present. Three patients worked in a noisy environment, in which it was necessary for them to shout in order for them to be heard.

By mirror laryngoscopy one observes marked thickening of one or both cords throughout the membranous portion. The posterior cartilaginous portion beginning at the tip of the vocal process of the arytenoid is generally not affected. No interference with motility of the arytenoids can be discerned.

They summarize as follows: Surgical stripping of the mucosa of the vocal cords secured satisfactory anatomic and functional results in eight cases of chronic hypertrophic laryngitis. Although the group of cases was not large, this condition is infrequent. The pathologic changes in this disease are hypertrophy and hyperplasia, and surgical extirpation must be performed to effect a cure. Stripping of the cordal mucous membrane in cases of hypertrophic laryngitis associated with diffuse edematous involvement of the entire membranous cord seems the best method of bringing about restoration of the voice and return of cord function.

According to Richards,<sup>47</sup> chronic laryngitis, incident usually to long standing abuse of the voice, is to be treated on some-

what the same line as acute laryngitis but over a longer period of time and with some regard for the necessity of the patient's carrying on to some extent his normal activity. Avoidance of laryngeal irritation incident to smoking to the use of alcohol and to dusty and irritating atmospheres is important. Underlying and predisposing causes which may arise in other parts of the body system must be given attention, particularly the nose and nasal sinuses, as being a primary cause of secondary chronic laryngeal irritation. Obviously, no patient can safely be assumed to have simple chronic laryngitis unless other simulating conditions in the larynx have been ruled out by careful and reliable laryngoscopic examination.

Morton<sup>48</sup> points out that because actinomycosis is rarely diagnosed, many cases are missed and an understanding of the disease lags far behind that of other chronic granulomas. Its bacteriology is complicated by the large number of organisms which have been described, only a few of them being pathogenic to man, and none having any marked pathogenicity for laboratory animals. There is no generally accepted classification. Until a universally accepted bacteriologic classification is available, clinicians will have to be content with the presence or absence of the ray fungus and call the disease "actinomycosis." The appropriate drug or vaccine will have to be determined in each individual case. The many forms of treatment testify to the inefficiency of any type of therapy. Of the drugs, potassium iodide in moderate to large doses, *i.e.*, from 150 to 300 gr. (9.7 to 19.5 gm.) daily, is still the best therapy. Sulfanilamide used in two cases showed definite improvement in one, but there was no observable effect in the other.

Surgical treatment is imperative in nearly all cases. When complete excision is possible, it should be carried out; otherwise, incision and drainage of all abscesses is indicated, combined with such other treatment as may seem best suited to the case. The prognosis varies with the site affected. In all such suggestive cases, early and diligent search for the ray fungus should be undertaken and a culture made from the material of the wall of the abscess when the pus is sterile.

Poe<sup>49</sup> summarizes as follows: A case of sarcoid of the larynx is reported. So far as it has been possible to ascertain,

that is the first complete description of Boeck's sarcoid of the larynx.

To make this report of practical value to the laryngologist, a dermatologic description of the infiltrations is also given. The Roentgen findings of the chest are presented, for such observations may serve as indications of deeper involvement.

Nowhere is ulceration observed. The patient experiences no pain.

Grove's<sup>50</sup> summarization is as follows: Repeated studies of the blood should be made in every case of a pharyngeal lesion, the diagnosis of which is in doubt. Infectious mononucleosis is an acute, self-limited disease occurring in epidemic or sporadic form in children or young adults; it is characterized by pharyngeal manifestations, fever, glandular enlargement, a characteristic blood picture and an antibody response to heterophil antigen. Laryngologists must keep this condition in mind when investigating any acute, obscure lesion of the throat.

#### MEDICATION.

Fenton<sup>51</sup> states that one should consider, first, the effects of these drugs on the laryngeal epithelium, discounting as negligible for the purpose of this study any mechanical effect, such as pressure from the lip of the laryngoscope; and, second, reparative or irritative reactions demonstrable in the tunica propria. Of all the mucous membranes of the respiratory tract, this submucosal stroma has by far the greatest reparative power. Epithelium is readily damaged, but with a healthy stroma below it is speedily repaired, although not always with the same cells as at first.

Strong caustics—lactic and trichloroacetic acids (50 per cent)—proved violently destructive to the laryngeal epithelium. Marked activity of the mucous glands, coupled with pronounced leukocytic infiltration, pointed to an immediate stimulation of reparative effort.

One per cent monoparachlorophenol, which is commonly injected intratracheally, stirred up pronounced epithelial losses and edema; but together with a good deal of exudate there occurred marked glandular activity and lymphocytic

infiltration. This is a potent and rather caustic agent but it apparently also promotes strong defensive reactions.

One per cent silver nitrate showed little surface damage after 24 hours, with relatively slight submucosal injection.

A curious puckering of the epithelium, without much tissue loss and with numerous subepithelial cysts surrounded by leukocytes, was observed both with 1 per cent mercurochrome and with 1 per cent chaulmoogra oil in sesame oil.

Twenty per cent mild protein silver in water caused little epithelial damage but much stimulation of mucous glands and the surrounding stroma.

Typical of the aromatic oils, 1 per cent thymol in liquid petrolatum and 2 per cent gomenol in olive oil both caused considerable edema, thymol accumulating little exudate, while gomenol was responsible for a good deal.

Reparative efforts are stirred up by all these substances but serious epithelial losses occur with all the stronger solutions, whether oily or aqueous.

Fortunately, the cough reflex rapidly removes most intralaryngeal irritants. The experimental animals were not able to cough for several hours owing to deep anesthesia, which may explain the severity of some of the reactions.

Nevertheless, in line with previous microscopic observations on the sinal membranes, it may be asserted that local applications to the larynx should be highly dilute and small, limited strictly to the region in which stimulation or reparative or antiseptic action is desired. Inundating the larynx with instillations of powerful drugs may do far more harm than good.

The histologic effects observed seemed to be due largely to absorption of the aqueous content of epithelial cells by the hypertonic medicaments employed. Immediately after application, Nature endeavors to wash away the irritant by increased secretion of mucus. Actual epithelial losses, covered at first by a thickened mucous sheet, receive reinforcements consisting of large numbers of polymorphonuclear leukocytes and lymphocytes.



Comparatively slight reaction from oily solutions, in spite of abolition of the cough reflex by heavy anesthesia, suggests the comment that damage from nonabsorbable oils in the tracheobronchial tree is due to the thin and delicate mucosal protection of bronchioles and alveoli. The larynx, per contra, epithelium of several layers with a highly vascular tunica propria and is normally guarded by a cough reflex of explosive violence so that powerful agents would not under normal circumstances remain long in contact with the glottic region.

According to Graef,<sup>52</sup> during the last five years 22 cases of lipid pneumonia have been studied at Bellevue Hospital. Differential histochemical studies of the lipid were made in each case; in seven instances these studies were supplemented by chemical analysis which corroborated the conclusions drawn from the microscopic observations. A study of the pneumonic lesions in 15 cases revealed the presence of intracellular lipid considered to be liquid petrolatum. The earliest response to the aspiration of this oil is an outpouring of macrophages which engulf the finely emulsified oil and accumulate in the alveoli. The aspiration of the oil may be associated with pyogenic infection. In infants it may lead to asphyxial pneumonia. Macroscopic lesions varied from small pseudotuberculous fibrous scars to lobar consolidation resembling gray hepatization of the lung.

Microscopic lesions from an acute macrophagic response to dense proliferative scars with imprisoned globules of oil.

Walsh and Cannon recommend the discontinuance of oils as vehicles for all nasopharyngeal medicaments on the evidence that drugs dissolved in oil act less effectively than those dissolved in isotonic saline solution. The manufacturers of oily "nose drops" should set a limit to the capacity of the droppers. The doses for infants and adults should be so adjusted as to prevent accumulation and free flow into the nasopharynx. With the present droppers, from 3 to 6 cc. of liquid petrolatum may be introduced into the nares of small infants by unsuspecting parents, nurses or physicians. Adequate warning should be given the public against overdosage with any intranasal medication. The use of liquid petrolatum as a lubricant or therapeutic agent in the larynx and trachea should be stopped, in view of the difficulty of removing this lipid from the lung. The damage caused by the accumula-

tion of even small amounts administered repeatedly over a long period is sufficiently great to warrant the replacement of this oil by other less irritating and more readily removed liquids. There is always the added danger of aspiration of other agents — bacteria, spores or fungi — with any nasopharyngeal liquid.

Viole<sup>53</sup> says there were four cases of laryngotracheobronchitis and three of streptococcic pharyngitis; tracheotomies were performed on three of these. In this particular group it is interesting to note that the rate of recovery and the definite signs of improvement were much slower and more gradual in three of the patients who were treated with prontosil in addition to the scarlet fever serum. In the others, who received only the serum, except one on whom a tracheotomy had been performed, improvement was immediate and almost spectacular. This may have been merely a coincidence; nevertheless, we feel that it is an interesting phenomenon.

He concludes by saying there seems to be definite proof in the foregoing that patients suffering from hemolytic streptococcic infections are benefited by the use of pooled convalescent scarlet fever serum. This is especially true in cases of streptococcic sore throat and laryngotracheobronchitis. In the latter instance it is possible that, given in sufficient quantity and early enough, it will do away entirely with the necessity and hazard of tracheotomies.

In Holman's<sup>54</sup> summary, he states: 1. 70 patients, from low economic levels, admitted to the Stanford-Lane Clinic wards for operation, were studied with respect to the vitamin C content of their blood. In 44 per cent of these patients, values of 0.15 to 0.30 mg. per 100 cc. of blood were found, indicative of a low vitamin C intake. In nine patients, values fell below 0.15 mg. per cent, indicating they were on the verge of clinical scurvy.

This evidence of deficiency in vitamin C is of extreme importance in surgical patients, since ascorbic acid or vitamin C is intimately concerned with the synthesis and maintenance of the intercellular supporting materials which provide the framework of healing. Experimental observations by Lanman and Ingalls showed that abdominal wounds of scorbutic animals ruptured at a pressure one-third that required to rupture the wounds of normal animals.

Since the effect of vitamin A is to produce metaplastic changes in epithelial structures, a deficiency in this vitamin is of real importance in patients who, following operation, are threatened with infections of such epithelial structures as the salivary glands, the bronchi, the lungs, the gastrointestinal canal and the genitourinary system. Animals on diets deficient in vitamin A develop abscesses and infections in these regions.

These observations indicate that surgical patients should, whenever possible, be prepared for operation by several days of optimum nutrition, including a well balanced diet of high protein intake of high caloric value and of high vitamin content. This period of preparation should begin at home 10 to 14 days before operation.

This preparation should also include vitamin concentrates for five to seven days before operation; tablets thrice daily, juice of four oranges and two lemons daily.

Following operation, optimum nutrition should again be instituted through a well balanced, high caloric, high vitamin diet, supplemented by vitamin concentrates, throughout the full convalescent period.

The ordeal of operation, with its attendant hazards, should be undertaken, whenever possible, only in patients in a state of optimum nutrition. For the past 11 years, patients admitted to the Stanford-Lane Clinic wards under Holman's control have been prepared for operation by a high caloric, high vitamin diet, supplemented by vitamin concentrates.

Goodyear<sup>55</sup> states the following: At the time of removal of adenoids there was, intermittently, a wheezing sound on breathing, and the child had not been eating well.

Owing to the slight wheezing sound that could occasionally be heard, the parents were asked permission to examine the larynx with a laryngoscope at the time of the adenoid operation. A medium-sized safety pin, open, was found, with the point embedded in the right arytenoid area, which was removed with forceps. The "keeper" was not present. The adenoids were then removed, and the child made an uneventful recovery.

The following history was obtained: Four and one-half months previous, while on a visit in the east, the child suddenly showed some difficulty in breathing, and cried a great deal for three or four hours. There was no temperature until three or four days later, when the child seemed to have a cold.

With the difficulty in breathing and the history of allergy in the family, a number of skin tests were performed without any positive findings. After several weeks the child returned to Cincinnati.

The family recalled that at the time of onset the nurse found the "keeper" of a moderate-sized safety pin on the floor in the child's room, but the pin itself was not located.

From the sudden onset and for four months there were times when the child was difficult to feed, and there were occasional attacks of some hoarseness and slight impairment of breathing.

Richards<sup>56</sup> states that central nervous system disease producing such paralyses often entails many diagnostic difficulties before intelligent treatment can be applied. Weakness of the approximating laryngeal muscles and certain forms of hysteria producing weakness or fatigue of the voice must frequently be treated from a psychologic standpoint and by instruction in proper use of the voice. Almost all therapy is dependent first of all on careful and intelligent mirror examination of the larynx.

Katz<sup>57</sup> studied 100 consecutive patients for toxic manifestations of sulfapyridine. All symptoms and signs referable to toxicity were carefully recorded. Approximately one-half of the adults and one-fifth of the children exhibited some toxic side reactions. Nausea and vomiting, appearing in 25 per cent, were the most commonly encountered toxic manifestations. There was no apparent correlation between the gastric irritability and the amount of the drug administered. Disturbances of the central nervous system were observed in 7 per cent and varied from mild personality changes to the more serious psychoses. There were four cases of hematuria. This disturbance is apparently caused by the irritating effect of the sharp acetylsulfapyridine crystals that precipitate in the urine. Stasis appear to be an important predisposing fac-

tor in the production of hematuria following the use of sulfapyridine.

Dermatitis in two cases and jaundice in three were the other serious symptoms noted. Diarrhea, lethargy, abdominal pain, cyanosis and dyspnea were also encountered. Drug fever, vertigo, headache, tingling of the extremities, acute hemolytic anemia and granulocytopenia were not observed. With the recognition of the toxic manifestations, constant observation will allow detection of the toxic symptoms while they are amenable to appropriate counter-measures, permitting this valuable drug to be used with a satisfactory margin of safety.

Richards<sup>58</sup> states that throat inflammations complicating systemic disease must frequently come under observation, particularly of the general practitioner. Prominent among these is the sore throat incidental to scarlet fever and that seen in mononucleosis and agranulocytic angina. The blood picture is most important in diagnosis and the treatment is that of the underlying condition.

Smiley<sup>59</sup> reports that in a review of the literature only three cases of polypoid laryngeal disease following endotracheal anesthesia could be found.

The case to be reported here was that of a woman, age 35 years, on whom operation for stenosis of the common bile duct had been performed with cyclopropane anesthesia endotracheally. On the tenth postoperative day she complained of hoarseness, and laryngeal examination showed a small polyp in the left side of the larynx. Removal was advised but was refused until about two months later. The microscopic diagnosis was a granulation tissue with acute and chronic inflammatory changes (pyogenic granuloma). The polyp was a soft, rounded mass about 1.5 cm. from above downward and about 1 cm. in transverse diameter, and was pedunculated.

It seems justifiable to conclude that this subglottic granuloma was a result of trauma caused by the endotracheal anesthesia. It is suggested that the larynx may react to trauma by the formation of an infectious granuloma such as that infrequently found on the nasal septum.

In reporting on anesthesia, Tuohy<sup>60</sup> reports that one must keep the physiological process in mind when administering an inhalation anesthetic because there are many factors which will influence the process of diffusion of gas and vapors into the blood stream. Stridor may occur as a result of administering an anesthetic agent too rapidly, and in this case the stridor is usually due to the irritating action of the anesthetic on the vocal cords. Also, it may be attributable to indirect stimulation of other tissues, such as traction on the pelvic and abdominal viscera.

The treatment of stridor due to too concentrated mixtures of anesthetic agents is usually simple and is accomplished by diluting the anesthetic vapor with oxygen. If stridor occurs when traction is made on viscera, it is frequently more difficult to correct, and the situation is usually embarrassing to the anesthetist. Laryngeal spasm may be produced in relatively deep, as well as light, surgical anesthesia when visceral traction is made, and it seems that the most effective remedy is intratracheal intubation. Occasionally an increase in bag pressure will help to reduce the stridor and decrease the noise incident to the vibration of the vocal cords. The difficulties encountered with this procedure are: the possibility of distending the stomach with gas, and the fact that the procedure is tedious and wasteful of gases. When an inhalation anesthetic is administered to young children by the closed method or by the so-called carbon-dioxide-absorption method, one should employ a type of gas machine and carbon-dioxide absorber unit which will require the least expenditure of respiratory effort on the part of the child. The "to and fro" type of apparatus employing an absorber placed between a face mask and breathing bag probably requires less effort than the type of gas machines using so-called circle breathing units.

Not having any benzedrine sulfate tablets available, Hanelin<sup>61</sup> asked a patient with paroxysmal hiccup of five hours' duration to inhale (once in each nostril) the volatile preparation of amphetamine sulfate. Relief from hiccups was instantaneous and without recurrence. He reports two similar cases (one following an operation) in which an inhalation of amphetamine sulfate resulted in complete abatement of the symptoms. The inhalation of amphetamine sulfate in the treatment of paroxysmal hiccup due to the usual systemic

reaction, the author states, coincidentally stimulates the sympathetic nerve fibres of the gastrointestinal tract (through the thoracolumbar chain of sympathetics with subsequent stimulation) and releases the smooth muscle spasm possibly due to excessive vagus stimulation.

*Sulfanilamide in Treatment of Sore Throat:* Rhoads and Afremow,<sup>62</sup> in summarizing, state that in their series of 31 sulfanilamide-treated patients and 36 controls treated under similar conditions but without sulfanilamide, the drug was not found to reduce the severity of the symptoms, shorten the period of incapacity, reduce the incidence of complications or reduce the duration of the carrier state. Toxic manifestations of the drug other than the usual cyanosis occurred in one-half of the cases in which sulfanilamide was administered. In a few instances these reactions were serious enough to cause genuine concern.

#### PERICHONDRITIS OF THE LARYNX.

Richards<sup>63</sup> states that laryngeal tuberculosis represents an instance of the importance of accurate laryngologic examination with the laryngeal mirror as being the only means by which differentiation can be made in many chronic laryngeal lesions producing hoarseness as almost the only symptom. An antituberculosis regimen is obviously essential, since in almost every instance of laryngeal tuberculosis the patient will be found to be suffering also from pulmonary tuberculosis.

The same importance of accurate diagnosis also obtains in the case of hoarseness due to syphilitic lesions of the larynx. The clinical appearances may be still more bizarre even than those of tuberculosis and there is no diagnostic pattern on which one can definitely rely. Serologic tests will, of course, lend credence to this diagnosis, the treatment being that of syphilis of other parts of the body.

Piquet, Boury and Canonne,<sup>64</sup> in reporting on laryngeal tuberculosis, state that it is occasionally found in an apparently healthy patient. Latent pulmonary tuberculosis is discovered by careful examination. In general, vegetative masses develop, although infiltration and deep ulceration are common. Clinical diagnosis is difficult, even impossible. Biopsy



may not be conclusive. The state of the laryngeal lesion parallels that of the pulmonary one; hence the treatment must be directed to the pulmonary condition. The laryngeal lesion may heal spontaneously or may require galvanocautery.

Regarding dysphagia in laryngeal tuberculosis, Iljisch<sup>65</sup> states that on the basis of the experiment of Rethi on the act of swallowing, the author explains the production of dysphagia as a result of infiltration of the false cords. In swallowing, the cords are shortened and thickened, and no doubt the false cords act likewise. This change in the structure of the false cords, associated with a tearing of the underlying arytenoid gland of Morgagni, can at times produce pain in swallowing, although ulcerations are present. In cases of ulceration of the false cords, pain is observed when the infiltrated areas approximate each other. The prognosis of dysphagia caused by infiltration of the false cords is good, as the lesions can be influenced by treatment (although no details of therapy are discussed by the author).

*Tuberculosis of the Larynx in Childhood:* As reported by Howie,<sup>66</sup> in the early stages of laryngeal disease there is seldom any indication of its presence. There is often no hoarseness. Pain was never complained of, even when the condition had advanced to a perichondritis of the arytenoid or epiglottis.

In dealing with young children, it has been found difficult to enforce absolute silence. In all laryngeal cases an inhalant of creosote is used. When a child is obviously going downhill, no restrictions are placed on it.

A report is given of the laryngeal lesions found in a series of 159 children of both sexes suffering from tuberculosis of the lung.

1. An account is given of the material examined, and tables are drawn up showing age and sex distribution, type of lung disease, type of infection (human or bovine) in 90 "open" cases, laryngeal disease in relation to pulmonary condition, and type of infection (human or bovine) in relation to laryngeal disease.

2. Attention is called to the high incidence of laryngeal lesions in the "open" cases — 42.2 per cent.

3. Signs and symptoms are recorded.
4. Types of lesion met with are described and a detailed account is given of nine cases under the age of 10 years, the youngest being 4 months.
5. Treatment and its results are described.
6. Several nontubercular laryngeal lesions also found are recorded.
7. Postmortem material is described and illustrated.
8. The route of infection is discussed and evidence is put forward for concluding that the infection is the result of direct implantation of the tubercle bacillus in the tissues of the larynx.

Howie<sup>67</sup> looked for laryngeal lesions when examining 159 children, age from 4 months to 16 years, suffering from pulmonary tuberculosis — tubercle bacilli were present in the sputum or in the stomach washings of 90 of these. Thirty-eight of the "open" cases presented tuberculous laryngeal lesions. Tuberculous laryngeal disease was present in only three cases with sputums or stomach contents negative for tubercle bacilli. It appeared that bovine and human infection are equally prone to produce laryngeal disease. Most of the lesions occur in open cases with cavitation and bronchopneumonic pulmonary lesions. Postmortem examination of specimens confirmed this observation. The youngest child to have tuberculosis of the larynx was an infant, age 4 months. He died with multiple lesions in the mastoid, the kidney and the intestine. The lungs showed extensive bronchopneumonic disease.

Oatway,<sup>68</sup> in commenting on laryngeal changes in acute hematogenous tuberculosis, states as follows:

An acute edematous laryngitis and pharyngitis with a progressively destructive tendency and severe symptoms of pain, dysphagia and hoarseness has been seen in 19 instances.

It occurred predominantly in males and often in a relatively advanced age group.

There had been a definite, or possible, hematogenous dissemination in all cases, as seen in X-ray films of the lungs,

and there was almost invariably an underlying chronic, advanced and infectious pulmonary tuberculosis.

The syndrome has been rapidly fatal in all but one of the 19 cases.

The condition is not extremely rare.

The standard literature contains few references to its occurrence. The pulmonary and laryngeal tuberculosis was usually undiagnosed before admission to the hospital. The cases present a serious public health problem, which can be minimized by recognition and isolation.

Looper<sup>60</sup> found the onset to be most frequent between 20 and 40 years of age in a study of 500 patients with laryngeal tuberculosis. The complication is secondary to the pulmonary condition and results from lowered tissue resistance. The diagnosis is not difficult. Pharyngeal tuberculosis is fortunately rare. It is a grave condition, for which little can be done. A well advanced infection in the interarytenoid space or ventricle may give little or no disturbance, but a small degree of infiltration of the cord will produce huskiness and later hoarseness or aphonia. A biopsy may be necessary. Many cases of laryngeal tuberculosis can be prevented by earlier recognition, educational measures and correction of pathologic conditions in the upper respiratory tract. Of the 500 patients with laryngeal tuberculosis treated in the sanatorium, 142 had moderate pulmonary involvement. The throats of 95 were cauterized. The throats of 136 of the 358 patients with far advanced pulmonary involvement were cauterized. The throats of 93 patients of the first group were improved and healed. Two patients died. Of the patients in this group whose throats were not cauterized, 15 were improved and healed, 26 were unimproved, and six died. Of the 136 patients in the second group, cauterization treatment improved and healed the throats of 93, 22 were not improved, and 19 died. Of the 222 patients in this group whose throats were not cauterized, 14 were improved and healed under sanatorium care, 112 were unimproved, and 96 died. Cautery treatment was contraindicated in advanced toxic cases.

Myerson<sup>70</sup> believes tuberculosis of the larynx must be considered always secondary to disease of the lung. He also

believes the larynx is invaded by way of the blood stream or lymphatics.

Most authors agree that localization in the larynx and the consequent tissue reaction constitute an allergic phenomenon. This allergy indicated a defensive mechanism in the response of the sensitized tissues to the antigen, which is the tubercle bacillus. The exudative reaction in tuberculosis of the larynx is no different than such a reaction elsewhere.

Acute generalized miliary tuberculosis of the larynx is a massive invasion of the larynx by way of the blood stream. When this occurs, not only the larynx but every organ in the body may be involved. In most cases of tuberculosis of the larynx, the use of the laryngeal speculum should be avoided. Direct laryngoscopy is harmful and is contraindicated in the presence of an acute and active tuberculous lesion.

As to prognosis, the laryngeal condition is usually correlated with and dependent on the pulmonary disease. Laryngeal complications may have a harmful effect on the outcome of the pulmonary condition, just as the pulmonary disease influences the larynx unfavorably.

Rossi,<sup>71</sup> in reporting on cancer and tuberculosis of the larynx, states as follows:

1. Cancer of the larynx in a tuberculous subject without tuberculosis of the larynx.
2. Cancer developing in a larynx already invaded by tuberculosis.
3. Primary cancer of the larynx, upon which is implanted a tuberculous infiltration.

The first two of these groups are fairly common, the third is extremely rare, and all the four cases described belonged to the second group.

The author considers that there is no antagonism between cancer and tuberculosis, and that the presence of one has no effect of preventing the occurrence of the other.

Bine and Villata<sup>72</sup> state that in tuberculosis of the trachea, ulceration in the mucosa is the most common type seen, followed by a nodular infiltration and by caseation. All these forms may appear at one time in the same trachea.

Tuberculosis may occur in any segment of the trachea with equal frequency, but it shows a predilection for the posterior membranous area rather than for the cartilaginous portions. There is as a rule very little formation of fibrous tissue or scarring after healing.

The path of infection is mainly direct from the sputum, but occasionally by the extension from the paratracheal glands. Only rarely is the infection transmitted by the blood or lymph stream.

Degeneration is common in the perichondrium or cartilage of the rings but hypertrophic or neoformative changes are rare. Such changes may, however, occur in association with catarrhal lesions in the trachea.

#### ACUTE AND CHRONIC LARYNGEAL STENOSIS.

According to Figi,<sup>73</sup> chronic stenosis of the larynx continues to offer some of the most difficult problems confronting the laryngologist.

The etiology of chronic stenosis of the larynx varies greatly. The condition may be the result of a congenital abnormality, or it may result from accidental or surgical trauma. Radiation therapy often has a direct bearing on causation. Local or systemic disease, paralysis of the recurrent laryngeal nerves, lesions affecting the central nervous system, and benign or malignant neoplasms of the larynx may be responsible. The degree, character and extent of the stenosis may likewise differ. Until recent years, laryngologists felt that open operation for correction of cicatricial stenosis of the larynx should be done only as a last resort. Many still insist that the possibilities of all conservative measures should be exhausted before considering radical surgery; however, increasing experience shows that in many cases of marked cicatricial stenosis, open operation offers the best and, at times, the only possibility of restoring the lumen, and that it might better be restored first than last.

In cicatricial stenosis of the larynx, loss of the sphincteric action of the superior laryngeal orifice is possible. Fortunately, such a complication is rarely found.

Maxwell,<sup>74</sup> in summarizing a report of stenosis of the larynx due to paralysis of the vocal cords, states:

Twenty-nine cases of bilateral paralysis of the vocal cords seen in the University of Michigan Hospital in the past 10 years are reported and analyzed regarding etiology and treatment.

Five cases subjected to submucous vocal cord resection by modifications of the technique proposed by Hoover are recorded.

In selected cases, a submucous resection of the vocal cords offers satisfactory relief from the dyspnea produced by bilateral abductor paralysis. It falls short of producing an ideal end-result, however, in that there is in most instances an unsatisfactory voice.

The objection that food and fluids may flow into the trachea because of the loss of the protective sphincter mechanism of the larynx has not been encountered in the operated cases presented.

Imperatori<sup>75</sup> reports on a patient with laryngeal stenosis due originally to multiple papilloma. Attempts to treat this condition resulted in a complete stenosis, induced by radium therapy externally and internally and by two laryngostomies. When he was presented he had a No. 38 core mold within his larynx, and on removal of this dilator his larynx would immediately contract. After his presentation it was decided to use a smaller core mold, and No. 26 was used up until the middle of November, 1939. It was then found that he would tolerate the removal of the core mold with very little contraction and closure of the tracheotomy opening. It was necessary to replace the core mold from time to time until the first week of April of this year, but since that time he has worn neither the dilator nor the tracheotomy tube. The tracheal stoma has been kept closed by adhesive plaster and a bandage. During the past year, he has worn a core mold for 229 days.

The important point that should be stressed in dilation of the larynx is not to overdilate it and promote epithelization.

The tracheal stoma will not be closed in this man until it is definitely certain that the laryngeal lumen will remain patent and of sufficient size.

The treatment of hoarseness due to various forms of laryngeal paralysis, according to Richards,<sup>76</sup> depends entirely

on the etiologic factor. Where such paralyzes entail severe obstruction to breathing, tracheotomy may be the only feasible method of at least temporary relief.

#### PARALYSIS OF THE LARYNX.

In speaking of experimental and clinical studies of pharyngeal and laryngeal paralysis, Sjöberg and Stromwall<sup>77</sup> described the following lesions in this region: an intramedullary tumor, syringobulbia, disseminated sclerosis, acute bulbar paralysis, Wallenberg's syndrome with thrombosis of the posterior inferior cerebellar artery and a circumscribed syphilitic meningitis. Peripheral lesions may include a tumor of the base of the skull or in the epipharynx, tuberculosis, syphilis or fracture of the base of the skull in the region of the jugular foramen.

A summary of their observations, both on these experimental animals and in clinical studies, are as follows:

1. In man, section of the glossopharyngeal nerve produces disturbance of taste and other sensory disturbances but no evidence of any interference of the motor functions of swallowing.
2. Recurrent neural paralysis with the midposition of the cords may be caused by lesions of the nucleus ambiguus or injury of the root fibres of the accessory nerve.
3. Section of the glossopharyngeal nerve in cats produces no paralysis of the pharynx, no lateral movement of the posterior pharyngeal wall (*mouvement de rideau* of Vernet) and no difficulty in the act of swallowing.
4. Section of the vagus nerve in cats produces a unilateral paralysis of the pharynx, *mouvement de rideau*, recurrent paralysis and the paramedian position of the cords.
5. Clinical and experimental studies have shown that the *mouvement de rideau* is due to a unilateral paralysis of the vagus and that the glossopharyngeal nerve has only a sensory function but no motor functions.

#### BENIGN TUMORS OF THE LARYNX.

New and Erich<sup>78</sup> state that cysts of the larynx are of three types: mucous, hemorrhagic and congenital. Laryngeal cysts



of the mucous and hemorrhagic varieties are not true tumors; that is, they are composed of cells which fulfill no physiological function. The cause of the congenital cysts has attracted the authors' attention. Schneider brought forth the hypothesis that such tumors arise from displaced embryonal cells which take part in forming the appendix of the ventricle. After considerable study, the authors are inclined to believe that Schneider's hypothesis is correct.

There are no symptoms diagnostic of a congenital cyst of the larynx. The signs and physical complaints are not characteristic of any specific tumor; they are, in fact, typical of any laryngeal lesion. The diagnosis must be based on visual inspection of the larynx.

*Recurrent Acute Laryngitis, Pachydermia Laryngis, Singers' Nodes and Papillomas:* Fox, Harned and Peluse<sup>79</sup> report that laryngeal conditions which frequently are due to an allergic diathesis are recurrent acute laryngitis, pachydermia laryngis, singers' nodes and papillomas. These represent acute, chronic, diffuse and circumscribed hyperplastic changes in the tissues of persons who reveal similar changes throughout the nasal, sinal and pharyngeal mucosa.

Chronic laryngitis includes low grade inflammatory conditions which result in local or general hyperplastic changes throughout the larynx. Lederer<sup>80</sup> stated that the continuous postnasal dripping of irritating secretions into the pharynx and larynx predisposes these areas to hypertrophic and hyperplastic changes. This opinion is generally accepted by most laryngologists, but the authors feel that it is particularly true for persons having a hyperplastic diathesis, for they have like changes throughout the respiratory tract, from the uppermost nasal and sinal mucosa to the terminal bronchioles.

Suehs and Herbut,<sup>81</sup> in commenting on hemangioma of the larynx, state that it is an uncommon condition. The cause: the neoplasms in cases of infantile hemangioma of the larynx are apparently congenital. Although chronic inflammation and vocal abuse, followed by hyperplasia, may be predisposing or etiologic factors of angioma in adults, this obviously cannot apply to infants.

The incidence with regard to sex appears to follow closely that found among adults. In this group, five of the patients

were male and only one female. The most prominent symptom is apparently obstructive dyspnea. There is little or no fever unless pulmonary complications arise. For the relief of obstructive dyspnea, a low tracheotomy is the procedure of choice, even when pneumonia is present. Histologically, the growth is a cellular capillary hemangioma.

In reporting on chondroma of the larynx requiring total laryngectomy, Equen and Neuffer<sup>82</sup> state:

*Classification:* A great deal has been written about the classification of cartilaginous tumors of the larynx. Virchow divided them into:

1. *Ecchondromas or Ecchondroses:* These arise from the deeper layer of perichondrium; that is, they are continuous with pre-existing normal cartilage.

2. *Enchondromas:* These tumors arise from cartilaginous rests; that is, they have no connection with pre-existing normal cartilage.

3. *Mixed Tumors:* As the name implies, these include several types of cells and are apt to become malignant.

Tobeck suggests the following:

A. *Chondroma.*

1. Those arising on the inner surface of the larynx.
2. Those arising on the outer surface of the larynx.

B. *Chondrosarcoma.*

The author summarizes: Chondroma is a rare condition that many experienced laryngologists will never encounter. It should be removed as soon as diagnosed.

Orton<sup>83</sup> reported a case of chondroma of the larynx in which a total laryngectomy was necessary. Also, citation of a case showing that chondroma of the larynx and carcinoma of the larynx may easily be confused. Chondroma is rare, and from the relatively few cases reported in literature it is obvious that not many laryngologists have had the opportunity to study these interesting cases.

In writing about laryngocele ventricularis, Lindsay<sup>84</sup> states:

1. The condition of laryngocele in man has been briefly reviewed and a case of superior external laryngocele described. Surgical removal was carried out with a successful result.

2. Additional evidence regarding physiological action of the true and false vocal cords, and of the intratracheal pressures during phonation, muscular effort with the upper extremities, straining movements and swallowing has been furnished by Roentgenological examination with the planograph.

3. The exciting factor in all cases of laryngocele in man is undoubtedly abnormally increased intraglottic pressure to which the ventricles are subjected. The occurrence of laryngocele in young children and females, and the known occurrence of congenitally long appendices of the ventricle suggests a congenital predisposition as a basic factor.

Weinberg<sup>85</sup> tells of two cases of sarcoma arising in the tracheal wall. The first occurred in a male, age 50 years. The condition ran a course of four and one-half years. Treatment had consisted of repeated endoscopic removal of tumor fragments from the trachea. Autopsy revealed a peritracheal and endotracheal tumor, 5 cm. in diameter, situated on the right lateral wall at the level of the third and fourth rings.

The second case occurred in a man, age 34 years. His condition lasted only a year. The first symptoms were cough and hemoptysis. This tumor, lying at the eighth tracheal ring, grew mainly into the tracheal lumen and metastasized to dependent portions of the bronchi and lungs.

Both cases represent rare tumors of relatively slow growth and low malignancy, causing death by mechanical embarrassment of the respiration and subsequent cardiac failure.

#### CANCER OF THE LARYNX.

Leborgne<sup>86</sup> reports on tomography and cancer of the larynx by stating that the interpretation of laryngeal tomographs is not difficult but it is absolutely necessary to have perfect tomographic films, and one has to take several films at different levels, in accordance with certain fundamental principles.

In the first place, the laryngeal cuts must be accurately parallel to the axis of the larynx and trachea, particularly in

the study of the subglottic region, because diagonal cuts bring forth apparent alterations of the laryngotracheal lumen due to defective technique. The cuts must be frontal so as to afford a comparative examination of both hemilarynges on the same film.

There are difficult results to obtain because the trachea and larynx are not always straight. There are anatomic features that help in interpretation. Certain tomographs may be used and may be valuable for diagnosis, even if the picture of the trachea is not quite correct, providing one can differentiate the distortions due to the geometric causes previously explained. It is absolutely necessary that the tomographic features be compared with those of the lateral Roentgenogram and the laryngoscopic view.

It is the author's opinion that from such a plan of study one can obtain exact and valuable information on the pathologic conditions in a particular case of cancer of the hypopharynx or larynx.

Marschik<sup>87</sup> states that early diagnosis often renders unnecessary mutilating operations and even allows complete intralaryngeal removal of beginning carcinoma. Irradiation of laryngeal carcinomas may sometimes effect a cure. On the other hand, preliminary irradiation is responsible for a less strict performance of radical operations and it may also damage vessels and cartilages. Therefore, Marschik does not consider radiation superior to surgery.

The author advocates surgical intervention in all cases except those of beginning carcinoma of the vocal cord which react to radium; however, irradiation should be applied after every partial and total extirpation.

*Epidermoid Carcinoma of the Pharynx, Buccal Mucosa and Larynx:* Lierle<sup>88</sup> comments as follows:

1. Well localized, differentiated lesions for the present, at least, respond better to surgery, or surgery combined with irradiation.

2. Advanced malignancies and undifferentiated tumors do not respond well to any treatment. Irradiation, the only treatment possible, is definitely of value. Months or years of life with freedom from symptoms may be obtained.

3. Education in regard to early recognition of malignancies is one of the most important problems to be solved.

End-results of surgical treatment of cancer of the larynx are influenced, according to Clerf,<sup>80</sup> by the extent of involvement, the location of the growth and the degree of malignancy. True cordal cancer should be treated by laryngofissure; cancer limited to the anterior commissure may be successfully treated by laryngofissure if a large segment of the overlying thyroid cartilage is removed; laryngectomy gives better results than laryngofissure in cases of subglottic cancer.

Employment of local anesthesia, prevention of inspiration of blood into the tracheobronchial tree during operation and prompt aspiration of secretions from the trachea after operation will decrease the incidence of postoperative pulmonary complications.

While the problems of anesthesia and preoperative and postoperative management and certain technical differences in the surgical management are important, the outstanding problems from the standpoint of end-results consist of prompt recognition and early diagnosis of cancer, so that appropriate treatment may be instituted without delay.

*Selection of Treatment for Cancer of the Larynx:* Martin<sup>80</sup> reports, in selecting the treatment for an individual case of cancer of the larynx, radiation and surgery, the two accepted methods, are often considered only from their competitive standpoints.

The author's discussion is based upon the premises that 1. cancer of the intrinsic larynx is mainly a surgical problem and usually unsuited to radiation therapy; and that 2. cancer of the extrinsic larynx is mainly a radiation problem, practically all cases being inoperable at the time of the first examination.

*Anatomic Classification:* The average surgeon describes intrinsic cancer vaguely as that which arises "within the lumen of the larynx," and extrinsic cancer as that which originates in the "walls outside the larynx." Radiologists are even more vague and are prone to include all extrinsic cancer under the broad term, "cancer of the hypopharynx," as distinguished from that of the mesopharynx and of the epipharynx.

The point of origin of any growth, rather than its later extension, should determine its anatomic classification; that is, if the lesion begins on a vocal cord, it should subsequently be classified as cancer of the intrinsic larynx, even though it may later extend upward to invade the structures of the extrinsic larynx or perforate the cartilage to invade the subcutaneous tissues. If one accepts this basis of classification, the term "mixed intrinsic and extrinsic laryngeal cancer" is superfluous, and "subglottic cancer" would be considered a subgroup of the intrinsic variety.

Beck and Guttman<sup>91</sup> state that laryngofissure is indicated when the neoplasm is small and restricted to one vocal cord. The disease must not have invaded either the anterior or posterior boundary of the cord, and the cord must be motile. The lesion, furthermore, must be an adult squamous-cell growth with no palpable glands in the neck. When these indications are met, the operation should prove adequate for a lasting cure in better than 80 per cent of the cases.

*Laryngofissure:* Laryngofissure has in its favor the following facts:

1. It is performed under local anesthesia.
2. The operative mortality is approximately 1 per cent.
3. The hospital stay averages one week.
4. There is frequent regeneration of the vocal cord, with complete return of the voice.
5. Five-year cures are obtained in 82 per cent of the cases.

Schinz<sup>92</sup> states that cancer of the vocal cord may simulate a papilloma and cause symptoms long before the movements of the cord become sluggish.

In general, according to this author, the results of Roentgen therapy are favorable and superior to those of surgery, providing the general condition of the patient permits adequate treatment and the cancer has not yet extended beyond the vocal cord, or when there is no fixation of the cord. The results are unfavorable when perichondritis has developed or when a tracheotomy has been performed previously. Such patients are usually in poor general condition, and there is great danger of necrosis of the cartilage.

Negus<sup>92</sup> reviews the diseases which most commonly cause confusion in a differential diagnosis of intrinsic carcinoma of the larynx. He, therefore, discusses chronic simple laryngitis, hypertrophic laryngitis, hyperkeratosis and pachydermia, syphilitic infiltration and leukoplakia, tuberculous laryngitis and simple neoplasm.

In long-standing or progressive hoarseness, the signs may be those of chronic inflammation. In such cases, nasal obstructions or chronic inflammatory changes in the nose, sinuses, mouth or pharynx are treated. Smoking should be abandoned, the use of alcohol kept within limits, and the use of the voice reduced or avoided altogether.

Hypertrophic laryngitis may occur as diffuse infiltration of the vocal cords and ventricular bands. There may be a localized tuberosity over the vocal process, or a heaping-up in the interarytenoid region, or, finally, an isolated plaque of keratosis may be present, particularly on the anterior third of one vocal cord. Biopsy may be required to settle the question as to whether drastic treatment is required.

Syphilitic disease of the larynx is such a rarity that its exclusion is probable in practically all cases. Syphilis is usually found to affect the pharynx, as well as the larynx.

Tuberculous laryngitis may show itself as diffuse and irregular thickening of the whole of one cord, even with fixation, but usually there is suspicious ulceration over the vocal process or in its neighborhood; there may be associated psuedoedematous swelling of the aryepiglottic fold. Occasionally a suspicion of tuberculosis may arise in a case in which the correct diagnosis is carcinoma. Here again, biopsy may be required.

It is sometimes possible for a simple neoplasm to produce signs and symptoms suggestive of malignant disease. Chondroma of the cricoid cartilage and, especially, papilloma in an adult may simulate malignant disease.

The author warns against the misleading results of biopsy. He cites the danger that wrong conclusions may be drawn when, in removing a portion of tissue for microscopic examination, the surgeon has not gone deep enough to embrace the cancerous area. Biopsy should afford a guide as to whether



laryngofissure, total laryngectomy, interstitial irradiation or teleradiation is indicated.

*Cancer of the Epiglottis:* Schall<sup>94</sup> states the most frequent symptom of cancer of the epiglottis is the sensation of a lump in the throat. There is also difficulty in the act of swallowing, and when the growth obtains sufficient size, there is respiratory embarrassment.

*Treatment:* Grade I or II carcinoma of the rim of the epiglottis is amenable to surgery. Carcinoma of grade III and IV, in the author's practice, has been treated by irradiation, either interstitial or external.

*Cancer of the Larynx:* The patient with laryngeal cancer is readily classified as belonging to one of three groups. The first group is that of early malignancy. The lesion may be limited to one vocal cord. In this group, too, are those cases in which the lesion involves the anterior commissure, with extension to both cords. The second group is that in which the lesion is no longer limited to the anterior portion of the larynx. The growth is essentially intrinsic, but of extensive involvement. The third group is the extrinsic lesion. The growth may have originated within the lumen of the larynx but has grown to involve the extralaryngeal structures, and frequently metastasis has already taken place.

*Treatment:* "In the surgical treatment of laryngeal cancer," Jackson says, "the choice of the operation is concerned with three factors; namely: 1. the location of the growth; 2. the extent of the lesion; and 3. the degree of malignancy. The indications for the surgical treatment of the first group of laryngeal cancer cases, in which the cancer has remained fairly well localized, differs but little with the various operators. The operation is that of thyrotomy or laryngofissure.

Israel<sup>95</sup> presents some conclusions concerning cancer of the larynx and its treatment by total laryngectomy:

1. Hoarseness persisting over a period of three weeks should be looked upon as a potential malignancy until proven otherwise. Persistent laryngeal discomfort should likewise be held under suspicion.

2. Total laryngectomy should be done without hesitancy in all cases of intrinsic laryngeal cancer beyond the scope of

laryngofissure. It is the surgical consultant's duty to make this differentiation.

3. The early removal of all dressings from the wound is a distinct forward step in the postoperative care, since it encourages primary union.

4. Surgery, when indicated, offers the greatest hope for cure in dealing with cancer of the larynx.

5. The co-operation of the radiologist in executing postoperative irradiation is important. The entire consequences and reasons, therefore, should be explained to the patient before operation. What the patient must undergo and what he can expect justify the use of the highest developments in the surgical art.

Bernheimer,<sup>96</sup> in reporting on extrinsic laryngeal carcinoma states that the extrinsic lesions have been divided into two groups:

1. Primary extrinsic laryngeal carcinoma.
2. Secondary extrinsic carcinoma resulting from extension or metastasis of primary intrinsic growth.

In reporting on intrinsic laryngeal carcinoma, the author states that in a series of 31 intrinsic lesions, there were four instances of recurrence or metastasis, and it is interesting to note that in two of these four, highly anaplastic lesions had been treated surgically. Ten of the cases treated surgically had had adequate irradiation therapy but had failed to respond; however, the 10 cases demonstrate that even adequate amounts of irradiation, up to 6,000 to 7,000 r.u., do not contraindicate surgical intervention.

He concludes by stating that 100 cases of extrinsic laryngeal carcinoma have been reviewed and an attempt made to establish why primary intrinsic disease became secondary extrinsic disease. The end-results of 31 surgically-treated intrinsic carcinoma of the larynx have been reported. In this group, 13 of the 14 patients who had fissures with cordectomy survived without evidence of disease for periods varying from nine months to 11 years. Two with hemilaryngectomies are also alive and well after one year, seven months, and two years, four months. Eleven of the 15 total laryngectomies

have survived without recurrences for periods extending from eight months to two years.

Frank and Lev<sup>97</sup> write that since the time of Virchow various tumors have been described as carcinosarcoma, or malignant tumors of dual origin. Recently, Saphir and Vass<sup>98</sup> have reviewed the literature of these tumors. From this study and from the study of a series of their own cases, they have shed grave doubt as to the existence of such tumors. Rather, they strongly suggested that in most cases of diagnosed carcinosarcoma the tumors were actually carcinomas which had undergone morphological variations and which at times resemble sarcomas.

The following surgical indications with reference to cancer of the larynx are reported by Jackson:<sup>99</sup>

1. Lesions occupying the middle third of one vocal cord are suitable for the operation of laryngofissure by the clipping technique, regardless of histologic character or grading.

2. Lesions reaching the anterior commissure and even involving the opposite cord are amenable to extirpation by the laryngofissure route also, but in such cases the Chevalier Jackson anterior commissure technique should be used.

3. Lesions in which the growth is cordal but has reached the posterior end of the cord and produced impairment of motility or has extended subglottically call for total laryngectomy.

Laryngectomy and pharyngotomy are also done in cases where the lesion is extrinsic, but the results in these cases are very unsatisfactory and it is possible that irradiation would accomplish as much in arresting the growth and prolonging life. On the other hand, in some of the extensive cases, especially in those with cartilage involvement or perichondritis there may be some advantage in removing the larynx preliminary to irradiation.

*Laryngectomy: A Plea for a Narrow Field Operation:* The following statements, though dogmatic in form, are offered as postulates by Jackson:<sup>100</sup>

The standard technique of laryngectomy is based upon extensive removal of lymphatic metastases. The advisability

of attempting to remove such metastases seems questionable; but, granting that it is advisable, are we justified in opening the whole front of the neck to get out the larynx of a patient who has no glandular involvement? Let us call this technique a wide field of operation. Unquestionably, it is the easiest way to operate because of its wide access. Its disadvantages are extensive trauma, much interruption of blood supply, poorly nourished flaps, retarded healing; and all four of these disadvantages combine to favor breaking down of pharyngeal repair and formation of pharyngostoma. Is it not better to do a narrow field operation, taking out the larynx through a midline incision and leaving the apparently uninvolved glands to be sealed up by irradiation if they should later show evidence of involvement? The history of the surgical treatment of cancer of the larynx shows that operators have closely followed the principles developed for dealing with cancer of the breast where anatomical and pathological conditions are quite different. In dealing with mammary cancer, a narrow field operation would be indefensible. In cancer of the larynx too advanced for laryngofissure but still intrinsic and free from evidence of cervical adenopathy, a narrow field operation seems to have many advantages.

Salinger<sup>101</sup> believes no patient should ever be subjected to either operation or irradiation without a preliminary biopsy. The best results will be obtained only when the laryngologist, the radiotherapist and the pathologist co-operate to the fullest extent, without prejudice. The patient is entitled to the best that all physicians have to offer, and when a prognosis is given in a particular case it should be based on the combined experience of the best observers, applied as closely as possible to the situation under consideration. Under no circumstances should a patient be misled by the wishful thinking of his physician, nor should he be permitted to make his decision without a full knowledge of what the available therapeutic agents have accomplished in the past.

*Clinical-Pathologic Classification:* Cutler<sup>102</sup> states that, because of the confusion that exists in the surgical, laryngoscopic and radiologic literature in the use of the terms extrinsic and intrinsic cancer of the larynx, and since the so-called extrinsic forms are actually pharyngeal tumors, it seems best to classify carcinoma of the larynx with reference to the site

of the origin of the tumor and not with reference to its extension. According to this conception, therefore, cancer of the larynx may be divided into four types:

1. Laryngeal vestibule (epiglottis, false cord).
2. Ventricle cavity.
3. Vocal cord.
4. Subglottic area.

*Carcinoma of the Laryngeal Vestibule:* This group includes two subvarieties:

1. Carcinoma of the free border and laryngeal surface of the epiglottis; and
2. Carcinoma of the false cord.

*Carcinoma Arising in the Ventricular Cavity:* These tumors grow silently within the ventricular cavity without producing symptoms or signs over long periods. A sudden attack of dyspnea may be the first indication of disease.

*Carcinoma of the True Vocal Cord:* This type composes the vast majority of endolaryngeal tumors. Early hoarseness is the most prominent clinical symptom.

Coutard<sup>103</sup> states that we now have a better knowledge of the chronological involution of cancer of the larynx, and of the chronological steps necessary for its treatment. For a long time we have been influenced by the fact that with extreme rapidity, whereas the differentiated forms disappear only after three or four months, but the dose which provokes the disappearance of the latter is approximately the same as that which causes the disappearance of the former. In differentiated cancer of the larynx, pharynx and buccal cavity the results of the new method seem better than those obtained heretofore.

Stebbing<sup>104</sup> reports that during the 10 years, 1929-1938, 392 cases of carcinoma of the pharynx and larynx were admitted to Lambeth Hospital under his care. In order to produce a classification of any value it is necessary to divide the 392 cases into six groups, according to the primary site: tonsil, pharynx, pyriform fossa, epiglottis, larynx and post-

cricoid; and each of these groups must be subdivided according to: *a.* the extent of the primary disease; *b.* the invasion of neighboring structures and, if so, which; *c.* the invasion of regional lymph nodes; and *d.* more distant metastases. Of the 392 patients, 190 were in such an advanced stage of disease and so feeble that only palliative treatment could be given, and as these 190 are distributed through all the groups, no reliable conclusion can be drawn from statistical analysis. In most cases the regional lymph nodes are affected by the growth and they must be included in the radiation.

Our next problem is to measure accurately the dose of radiation, and it is our custom to record the tumor dose that is delivered at each daily session. Measurements indicating the dosage of radiation have little meaning unless they are accompanied by a full description of the method of treatment but, generally speaking, it may be said that for the lesions under discussion about 4,500 r. should be delivered in 20 days, the dose increasing if, owing to the reaction, it has to be spread over a longer time.

In the author's 392 cases there were only two of this type who were well enough to undergo any treatment, and they were both treated by X-radiation and have both remained symptom-free, one for nine years and one for four years. The author further states that he has seen several of these cases in which insufficient radiation has been given, and operative removal is, he believes, the only treatment, since radiation cannot be repeated.

Hall<sup>105</sup> cites a case of carcinoma of the larynx wherein the patient had a chicken bone stuck in his throat — two months later the bone was removed. There was no hoarseness prior to swallowing the foreign body but there was hoarseness after. The larynx showed irregular ulceration of the right cord, with nodular infiltration posteriorly. The right cord was fixed. The left cord was normal except for slight redness — the movements were full. Direct laryngoscopy showed anterior commissure also involved in growth. *Biopsy:* Epithelioma. In following up this case: fenestration of larynx; neoplasm just through laryngeal cartilage on right side. 10 x 1 mg. x 0.5 pt. and 2 x 2 mg. x 0.6 pt. needles inserted. The needles were removed several days later. Later on, there

was pain and difficulty in swallowing; much thick sputum; larynx very tender. There was marked dyspnea; interior of larynx very edematous. A tracheotomy was performed. At intervals the patient coughed up fragments of laryngeal cartilage. The larynx was considerably deformed; no evidence of recurrence of neoplasm. The left cord moved freely; moderate glottic aperture. Advice was sought as to the possibility of decannulation.

In an analysis of the effects on the thyroid gland in six cases of malignant disease of the larynx, Gritti<sup>106</sup> reports that he was able to obtain fresh portions of the gland during life and to subject them immediately to preparation for histological examination. This was done during the operation either of laryngectomy or of tracheotomy. The author found that in two cases the gland was normal, in two there was a tendency to fibrous change, and in two more the fibrosis was well marked. In each of the two cases with normal thyroids and of the two cases with slight fibrosis, a tracheotomy was performed for marked dyspnea. Severe dyspnea was also present in one of the cases with marked fibrosis, but in the other there was no respiratory change.

The author considers that the blood supply to the thyroid is altered by the laryngeal tumor and that this gives rise to fibrotic changes. He demonstrates the intimate connection between the arterial and venous supply of the larynx and thyroid, and he claims that there is also a blood connection between the two organs through the aponeurotic tissue of the cervical fascia which connects them. He suspects that there may be some toxic products of the tumors which affect the gland.

*The Voice After Direct Laryngoscopic Operations, Laryngofissure and Laryngectomy:* Jackson<sup>107</sup> believes that the voice is the chief consideration in the treatment of most benign laryngeal conditions. In malignant conditions, voice must obviously be relegated to second place because the first and most urgent indication is to cure the cancer. He concludes:

1. After direct laryngoscopic operations for the removal of benign tumors, the voice should, except in special cases, be restored to normal clarity.



2. Nodules of the vocal cords should be carefully removed by direct laryngoscopic procedure (or by indirect laryngoscopic procedure if preferred); however, in cases of professional singers it is perhaps best to try first a period of vocal rest and special exercises.

3. While voice is of secondary importance in procedures undertaken for the eradication of a malignant tumor, the reply to a questionnaire sent out to a series of patients who had had laryngofissure or laryngectomy for cancer of the larynx showed that the majority had been able to develop useful voices and to resume their original occupation.

4. The majority of the patients who had developed a voice after laryngectomy considered it "good," while the majority of patients who had had laryngofissure considered their voices only "fair."

5. While many patients acquire spontaneously the knack of buccoesophageal speech, it is best to give laryngectomized patients a systematic course of voice lessons, as advocated by Morrison, just as soon as the wound is healed.

6. The artificial larynx should not be tried until after the patient has made some effort to develop a voice without it.

In reporting on teaching the laryngectomized patient to talk without the aid of the mechanical larynx, Levin<sup>108</sup> summarizes as follows:

Since the principles of esophageal speech are dependent on the altered anatomic and physiologic status following laryngectomy, the more important characteristic anatomic and physiologic facts are reviewed.

The methods of training laryngectomized patients to talk without the aid of a mechanical larynx are discussed in detail.

The surgeon's responsibility should extend beyond the operation and should provide for systematic training for the recovery of speech.

Patients can now be reasonably assured before operation that they can learn to talk in a normal way after removal of the larynx.

Speech instruction should begin as soon as healing has occurred and the physical condition permits. Esophageal

speech is acquired rather easily at this time, and the development of speech defects and mannerisms is avoided.

It is urged that all laryngectomized patients first be given the opportunity to learn the esophageal method of speech; the artificial larynx should be used only as a last resort for the exceptional patient who cannot master the esophageal method.

*New Restorative Operation Following Partial Extirpation of Larynx:* According to Brunings,<sup>109</sup> the severe mutilations resulting from the operations for advanced carcinoma of the larynx represent a great disadvantage of these methods. He thinks that in case of total extirpations these defects (lack of natural respiration and of voice) are probably unavoidable, but that in the partial resections (typical lateral resection, two-thirds resection and resection of frontal half), it should be possible to restore the respiratory tract and the voice by a plastic operation. In developing such a method he decided to use as a temporary tube-shaped supporting prosthesis a spiral of silver wire. The wire is from 0.3 to 0.6 mm. thick, and the internal diameter of the spiral measures from 6 to 14 mm. The author discusses the advantages of such spirals in plastic operations and describes how they are introduced and secured. Further, he describes and illustrates the cutting of the flaps that are joined over the spiral in order to repair the defect. He employed this restorative procedure in 14 cases, not only after lateral extirpations but even in some cases in which almost two-thirds extirpation had been done. The plastic repair was never made until at least from six to 12 months had elapsed since the tumor operation. During this time, relapses were carefully watched for. The closure of the defect was accomplished in all of the cases in which the author resorted to his plastic method. The fact that in some of the cases more than three years has elapsed since the plastic operation indicates that its results are permanent and that fear of a subsequent stenosis by shrinkage of the plastically-restored portion of the larynx or by atrophy of the skin with flutter and aspiration is not justified. The latter complication developed in one extremely emaciated patient two and one-half years after the intervention. The author stresses that the method is reliable and not dangerous, and that it requires only average surgical skill. Its value becomes

evident when it is considered that it removes the mutilation caused by the partial resection of the larynx, which is the most frequent intervention in internal laryngeal cancer. In repairing the mutilation, the restorative operation also removes the psychic, social, hygienic and professional disadvantages of the partial laryngeal resection. The author thinks that, in view of this possibility of repair, the partial resection will be used even more widely than it was formerly; for instance, it may replace not only laryngofissure with corpectomy but also the extremely mutilating total extirpation.

## BIBLIOGRAPHY.

1. SCHUGT, HENRY P.: The Pyriform Sinus, Anatomic and Clinical Observations, with a Review of the Literature. *Arch. Otolaryngol.*, 31:4:626-644, April, 1940.
2. WALDAPFEL, RICHARD: Pathology of the Subepithelial (Reinke's) Layer of the Vocal Cords. *Ann. Otol., Rhinol. and Laryngol.*, 49:3:647-658, Sept., 1940.
3. DEAN, LEE W.; CONE, ALFRED J.; BURTON, WM., and MOORE SHERWOOD: The Use of Laminagrams in Laryngology. *Arch. Otolaryngol.*, 32:2:398, Aug., 1940.
4. PRESSMAN, JOEL J., and HINMAN, ARTHUR: Further Advances in the Technique of Laryngeal Photography: THE LARYNGOSCOPE, 50:6:535-539, June, 1940.
5. MITHOEFFER, WM.: A Simple Treatment for Defects of the Singing and of the Speaking Voice. *Arch. Otolaryngol.*, 31:1:16-22, Jan., 1940.
6. FLATAU, T. S., in Denker, A and Kahler, O.: *Hanbuch der Hals-Nasen-Ohrenheilkunde*, Berlin, Julius Springer, 5:1301, 1929.
7. GREENE, JAMES S.: Vocal and Verbal Syndromes—Their Rhinolaryngologic Significance. *Arch. Otolaryngol.*, 31:1:1-6, Jan., 1940.
8. VOORHEES, IRVING W.: Defects in Speech in Relation to Defects in Hearing. *Arch. Otolaryngol.*, 31:1:7-15, Jan., 1940.
9. GOLDSTEIN, MAX A.: Defective Speech in Relation to Defective Hearing. *Arch. Otolaryngol.*, 31:1:38-44, Jan., 1940.
10. MOSES, PAUL J.: Is Medical Phonetics an Essential Part of Otorhinolaryngology? *Arch. Otolaryngol.*, 31:3:444-450, March, 1940.
11. FRANK, DAVID I.: Hoarseness—A New Classification and a Brief Report of Four Interesting Cases. *THE LARYNGOSCOPE*, 50:5:472-478, May, 1940.
12. WELLS, WALTER: The Significance of Hoarseness. *Ann. Otol., Rhinol. and Laryngol.*, 49:1:99-112, March, 1940.
13. WELLS, WALTER: The Significance of Hoarseness. *Ann. Otol., Rhinol. and Laryngol.*, 49:99:1116, March, 1940.
14. DAMITZ, J. C., and DILL, J. LEWIS: Chronic Hoarseness: Report of 300 Consecutive Cases. *Ann. Otol., Rhinol. and Laryngol.*, 49:4:996-1005, Dec., 1940.

15. BOMSKOV, C., and SLADOVIC, L.: Thymus as Incretory Organ. *Deut. med. Wchnschr.* 66:589, May 31, 1940.
16. REHN, E.: Hyperfunction of Thymus as Disease. *Deut. med. Wchnschr.*, 66:594, May 31, 1940.
17. JACKSON, C., and COATES, G. M.: The Nose, Throat and Ear and Their Diseases. W. B. Saunders Co., Philadelphia, p. 833, 1929.
18. FLAGG, P. J.: Treatment of Neonatal Asphyxia. *Maine Med. Assn. Jour.*, 31:1, Jan., 1940.
19. HIRSCH, CAESAR: Suffocation Due to Alcohol Intoxication. *THE LARYNGOSCOPE*, 50:4:331-339, April, 1940.
20. WORDEN, E. M.: Diphtheria Immunization. *Canad. Med. Assn. Jour.*, 43:44, July, 1940.
21. MURRAY, J. F.: Manzullo Immediate Tellurite Test in Diphtheria. *S. African Med. Jour.*, 13:787, Dec. 9, 1939.
22. NEVIUS, W. B., and McGRATH, ADA C.: Duration of Immunity to Diphtheria Achieved by Toxin-Antitoxin and Alum-Precipitated Toxoid. *Am. Jour. Dis. of Child.*, 59:1266, June, 1940.
23. RICHARDS, LYMAN G.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7:501-506, Aug. 17, 1940.
24. WILLIAMS, A. C.: Ludwig's Angina. *Surg. Gyn. and Obst.*, 70:140, Feb. 1, 1940.
25. GRODINSKY, MANUEL: Ludwig's Angina, Retropharyngeal Abscess and Other Deep Abscesses of the Head and Neck. *Jour. A. M. A.*, 114:1:22, Jan. 6, 1940.
26. MILLER, M. VALENTINE: Edema of the Larynx — A Study of the Loose Areolar Tissue of the Larynx. *Arch. Otolaryngol.*, 31:2:256-274, Feb., 1940.
27. WALDAPFEL, RICHARD: The Opening of the Anterior Tracheal Wall in Tracheotomy. *Surg. Gyn. and Obst.*, 71:2:191-193, Aug., 1940.
28. PALLESTRINI, E.: Indications for and Advantages of Transverse Incision of the Superficial Tissues in Tracheotomy. *Arch. Ital. di otol.*, 51:234, May, 1939.
29. MENNITO-IPPOLITO, RENATO: Cardiac Function in the Tracheotomized. *Arch. Ital. di Laringol.*, 1:5, 1938; *Laryngol. and Otol.*, 55:2:140, Feb., 1940.
30. CLERF, LOUIS H.: Foreign Bodies in the Air and Food Passages — Observations on End-Results in a Series of 950 Cases. *Surg. Gyn. and Obst.*, 70:2A:328-338, Feb. 15, 1940.
31. IMPERATORI, CHAS. J.: Hygroma Cysticum Colli: Report of a Case. *Arch. Otolaryngol.*, 32:2:392-393, Aug., 1940.
32. ORTON, HENRY B.: Cystic Hygroma. Reported before New York Laryngological Society, March, 1940.
33. MACCREADY, PAUL B.: Acute Laryngotracheobronchitis. *Conn. State Med. Jour.*, 4:3, March, 1940.
34. ORTON, HENRY B.: Acute Laryngotracheobronchitis. Read before the Academy of Ophthalmology and Otolaryngology, Cleveland, Oct. 6-13, 1940.
35. GALLOWAY, THOMAS C.: Laryngotracheobronchial Obstructions and Their Secondary Effects. Reprint from *Ohio State Med. Jour.*, 36:8, Aug., 1940.

36. WILSON, ARTHUR S.: Acute Contagious Diseases — Upper Respiratory Complications. *THE LARYNGOSCOPE*, 50:1:48-53, Jan., 1940.
37. FELTS, GEO. R.: Acute Infective Laryngotracheobronchitis. Reprinted from *State Med. Jour.*, March, 1940.
38. DAVISON, F. W.: Treatment of Acute Laryngotracheobronchitis. *Arch. Otolaryngol.*, 32:2:321-330, Aug., 1940.
39. DAVISON, F. W.: Some Observations on the Control of Temperature and Humidity in Oxygen Tents. *Ann. Otol., Rhinol. and Laryngol.*, 49:4:1083-1090, Dec., 1940.
40. BRIGHTON, GEORGE RENFREW: Laryngotracheobronchitis. *Ann. Otol., Rhinol. and Laryngol.*, 49:4:1070-1082, Dec., 1940.
41. ADAMS: Laryngeal Vertigo Occurring in a Case of Aneurysm of the Aorta. *Brit. Med. Jour.*, 2:335-336, Aug. 12, 1939.
42. BABBITT, JAMES A.: Laryngeal Epilepsy, with Symptoms Conforming to the Pattern of Substantiated Cases Reported in the Literature. Report of a Case. *Arch. Otolaryngol.*, 32:2:393-394, Aug., 1940.
43. JACKSON, CHEVALIER: Myasthenia Laryngis. *Arch. Otolaryngol.*, 32:3:434-463, Sept., 1940.
44. FROESCHELS, EMIL: Psychology of the Laryngeal Functions. *Arch. Otolaryngol.*, 32:6:1039-1044, Dec., 1940.
45. BROWN, J. MACKENZIE: Acute Infections of the Epiglottis. *Arch. Otolaryngol.*, 32:4:631-640, Oct., 1940.
46. PUTNEY, F. JOHNSON, and CLERF, LOUIS H.: Treatment of Chronic Hypertrophic Laryngitis. *Arch. Otolaryngol.*, 31:6:925-929, June, 1940.
47. RICHARDS, LYMAN B.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7:501-506, Aug. 17, 1940.
48. MORTON, H. S.: Actinomycosis. *Canad. Med. Jour.*, 42:231, March, 1940.
49. POE, DAVID L.: Sarcoidosis of the Larynx. *Arch. Otolaryngol.*, 32:2:315-320, Aug., 1940.
50. GROVE, W. E.: Laryngologic Aspects of Sporadic Infectious Mononucleosis. *Arch. Otolaryngol.*, 32:3:472-483, Sept., 1940.
51. FENTON, RALPH A.: Certain Reactions of Laryngeal Tissues to Medicinal Agents. *Arch. Otolaryngol.*, 32:3:429-433, Sept., 1940.
52. GRAEF, I.: Studies in Lipoid Pneumonia. *Arch. Pathol.*, 28:613, Nov., 1939.
53. VIOLE, PIERRE: The Use of Human Convalescent Scarlet Fever Serum in Streptococcic Infections Involving the Ear, Nose and Throat. *Ann. Otol., Rhinol. and Laryngol.*, 49:3:639-645, Sept., 1940.
54. HOLMAN, EMILE: Vitamin and Protein Factors in Preoperative and Postoperative Care of the Surgical Patient. *Surg. Gyn. and Obst.*, 70:2A:261-268, Feb. 15, 1940.
55. GOODYEAR, HENRY M.: Suspected Allergy, Bronchial Asthma, Open Safety Pin Found at Time of Adenoid Operation. Reprinted from *Cincinnati Jour. Med.*, June, 1940.
56. RICHARDS, LYMAN B.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7:501-506, Aug. 17, 1940.
57. KATZ, S.: Toxic Manifestations of Sulfapyridine. *N. Y. State Jour. Med.*, 40:746, May 1, 1940.

58. RICHARDS, LYMAN B.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7, Aug. 17, 1940.
59. SMILEY, WM. A.: Polypoid Granuloma of the Larynx Following Endotracheal Anesthesia. *Arch. Otolaryngol.*, 31:5:879, May, 1940.
60. TUOHY, E. B.: Anesthesia—Respiratory Physiological Phenomena During Inhalation Anesthesia. *Arch. Surg.*, 39:1001, 1939.
61. HANELIN, H. A.: Treatment of Paroxysmal Hiccup with Benzedrine Sulfate Inhalation. *Mich. State Med. Soc. Jour.*, 38:951, Nov., 1939.
62. RHOADS, PAUL S., and AFREMOW, M. L.: Sulfanilamide in Treatment of Sore Throat. *Jour. A. M. A.*, 943, March 16, 1940.
63. RICHARDS, LYMAN B.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7:501-506, Aug. 17, 1940.
64. PIQUET, BOURY, and CANONNE: Abstracts from Current Literature—Laryngeal Tuberculosis. *Rev. de laryngol.*, 60:313, April, 1939; *Arch. Otolaryngol.*, 31:4:703-704, April, 1940.
65. ILJISCH, ALEXANDER: Larynx: Regarding Dysphagia in Laryngeal Tuberculosis. *Monatsschr. f. Ohrenheilk.*, 73:369, June, 1939.
66. HOWIE, THOS. O.: Tuberculosis of the Larynx in Childhood. *Jour. Laryngol. and Otol.*, 55:6:269-281, June, 1940.
67. HOWIE, THOS. O.: Tuberculosis of the Larynx in Childhood. *Jour. Laryngol. and Otol.*, 55:269-302, June, 1940.
68. OATWAY, WM. H.: Laryngeal Changes in Acute Hematogenous Tuberculosis. Reprinted from *Am. Review of Tuberculosis*, 40:4, Oct., 1939.
69. LOOPER, E. A.: Diagnosis and Treatment of Laryngeal Tuberculosis. *Med. Ann. Dist. Columbia*, 9:120, April, 1940.
70. MYERSON, MERVIN C.: Phases of Tuberculosis of Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 48:707-746, Sept., 1939.
71. ROSSI, GIORGIO: Cancer and Tuberculosis of the Larynx. *Jour. Laryngol. and Otol.*, 55:2:137-138, Feb., 1940.
72. BINE, G., and VILLATA, I.: The Pathology of Tuberculosis of the Trachea. *Jour. Laryngol. and Otol.*, 55:2:137-138, Feb., 1940.
73. FIGI, A.: Chronic Stenosis of the Larynx with Special Consideration of Skin Grafting. *Ann. Otol., Rhinol. and Laryngol.*, 49:394-409, June, 1940.
74. MAXWELL, J. H.: Stenosis of the Larynx Due to Paralysis of the Vocal Cords—Treatment by Submucous Resection of the Vocal Cords. *THE LARYNGOSCOPE*, 50:5:452-462, May, 1940.
75. IMPERATORI, CHARLES J.: Laryngeal Stenosis: Report of a Case. *Arch. Otolaryngol.*, 32:2:391, Aug., 1940.
76. RICHARDS, LYMAN B.: Treatment of Diseases of the Throat. *Jour. A. M. A.*, 115:7:501-506, Aug. 17, 1940.
77. SJOBERG, ARNE A., and STROMWALL, EDWARD: Experimental and Clinical Studies of Pharyngeal and Laryngeal Paralysis. *Ztschr. f. Hals., Nasen. u. Ohrenheilk.*, 45:322, 1940.
78. NEW, G. B., and ERICH, J. B.: Congenital Cysts of the Larynx: Report of a Case. *Arch. Otolaryngol.*, 30:943, 1939.
79. FOX, NOAH; HARNED, JOHN W., and PELUSE, SAMUEL: Borderline Allergy, Its Relation to Hyperplastic Disease of the Respiratory Tract. *Arch. Otolaryngol.*, 31:3:502-516, March, 1940.

80. LEDERER, F.: Diseases of the Nose and Throat. Philadelphia, F. A. Davis Co., 1938.
81. SUEHS, O. W., and HERBUT, P. A.: Hemangioma of the Larynx in Infants. *Arch. Otolaryngol.*, 32:4:783-789, Oct., 1940.
82. EQUEN, MURDOCK, and NEUFFER, FRANK: Chondroma of the Larynx Requiring Total Laryngectomy. Reprint from *South. Med. Jour.*, 33:3, March, 1940.
83. ORTON, HENRY B.: Chondroma of the Larynx. Presented before the meeting of the Eastern Section of the American Laryngological, Rhinological and Otolological Soc., Inc., Jan. 10, 1941.
84. LINDSAY, J. R.: Laryngocele Ventricularis. *Ann. Otol., Rhinol. and Laryngol.*, 49:3:661-672, Sept., 1940.
85. WEINBERG, T.: Sarcoma of the Trachea. A Report of Two Cases. *Am. Jour. Cancer*, 37:201, 1939.
86. LEBORGNE, FELIX E.: Tomography and Cancer of the Larynx. *Arch. Otolaryngol.*, 31:3:424-425, March, 1940.
87. MARSHIK, H.: Present Status of Surgery of Carcinoma of the Larynx. *Ztschr. f. Krebsforsch.*, 49:250-274, 1939.
88. LIERLE, D. M.: Epidermoid Carcinoma of the Pharynx, Buccal Mucosa and Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 48:4:875, Dec., 1939.
89. CLERF, LOUIS H.: Cancer of the Larynx—An Analysis of 250 Operative Cases. *Arch. Otolaryngol.*, 32:3:484-498, Sept., 1940.
90. MARTIN, HAYES E.: Selection of Treatment for Cancer of the Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 49:3:728-735, Sept., 1940.
91. BECK, JOS., and GUTTMAN, M.: Carcinoma of the Larynx—Indications for Laryngofissure. *THE LARYNGOSCOPE*, 45:163, March, 1935.
92. SCHINZ, HANS S.: Cancer of Vocal Cord. *Strahlentherapie*, 66:203-218, Oct., 1939.
93. NEUGS, V. E.: The Differential Diagnosis of Intrinsic Carcinoma of the Larynx. *Surg. Gyn. and Obst.*, 69:1:11-12, July, 1939.
94. SCHALL, LEROY A.: Malignant Disease of the Upper Respiratory Tract: Diagnosis and Treatment. Reprinted from *Trans. Twenty-seventh Annual Meeting, Pacific Coast Oto-Ophthalmological Society*.
95. ISRAEL, SIDNEY: Cancer of the Larynx and Its Treatment by Total Laryngectomy. Reprint from *South. Med. Jour.*, 32:9:911-915, Sept., 1939.
96. BERNHEIMER, L. BENNO: Carcinoma of the Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 49:2:418-421, June, 1940.
97. FRANK, IRA, and LEV, MAURICE: Carcinosarcoma of the Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 49:1:113-123, March, 1940.
98. SAPHIR, O., and VASS, A.: Carcinosarcoma. *Am. Jour. Cancer*, 33:331, 1938.
99. JACKSON, CHEVALIER L.: The Surgical Treatment of Cancer of the Larynx. *Ann. Otol., Rhinol. and Laryngol.*, 49:1:267-268, March, 1940.
100. JACKSON, CHEVALIER L.: Laryngectomy: A Plea for a Narrow Field Operation. *Surg. Gyn. and Obst.*, 70:2A:521-522, Feb. 15, 1940.
101. SALINGER, SAMUEL: Radiation Therapy for Carcinoma of the Larynx: Observations After 20 Years. *Arch. Otolaryngol.*, 32:5:887-902, Nov., 1940.



102. CUTLER, MAX: Cancer of the Larynx—Relation Between Gross Anatomy. Microscopic Structure and Radiosensitivity. *Jour. A. M. A.*, 115:16:1339-1345, Oct. 19, 1940.

103. COUTARD, H.: The Present Conception of the Treatment of Cancer of the Larynx. *Surg. Gyn. and Obst.*, 71:1:15, July, 1940.

104. STEBBING, G. F.: Discussion of the Position of Radiotherapy in the Treatment of Malignant Disease of the Upper Respiratory and Alimentary Tracts, Excluding the Tongue and Esophagus. *Jour. Laryngol. and Otol.*, 55:9:427-445, Sept., 1940.

105. HALL, I. SIMSON: Carcinoma Larynx: Radiation Necrosis: Tracheotomy. *Jour. Laryngol. and Otol.*, 55:2:123-124, Feb., 1940.

106. GRITTI, PAOLO: Changes in the Thyroid Gland in Patients Suffering from Malignant Diseases of the Larynx. *Arch. Ital. di Laringol.*, 45:49, 1939.

107. JACKSON, CHEVALIER L.: The Voice After Direct Laryngoscopic Operations, Laryngofissure and Laryngectomy. *Arch. Otolaryngol.*, 31:1:23-36, Jan., 1940.

108. LEVIN, NATHANIEL MARTIN: Teaching the Laryngectomized Patient to Talk Without Aid of the Mechanical Larynx. *Arch. Otolaryngol.*, 32:299-314, Aug., 1940.

109. BRUNINGS: New Restorative Operation Following Partial Extirpation of Larynx. *Ztschr. f. Krebsforschung*, 49:278, Sept. 23, 1939; *Jour. A. M. A.*, 114:5:453, Feb. 3, 1940.

## SULFANILAMIDE IN OTITIS MEDIA IN CHILDREN.

DR. EDWIN B. BILCHICK and DR. GEORGE HUNTER O'KANE,  
New York.

Sulfanilamide has been extensively used in the treatment of otitis media and mastoiditis. Reports from different groups of observers have shown wide variations in results, though enthusiasm has been predominant; however, there have been few controlled comparative reports. This series<sup>1</sup> deals only with the use of sulfanilamide in moderate dosage in the treatment of otitis media in an active out-patient clinic, together with a control group of cases not treated with sulfanilamide.

In order to establish a proper control group of cases not treated with sulfanilamide, the following conditions were established:

The series was limited to three months — January, February and March, of 1939. The cases were unselected in any way. The treated cases were taken care of exclusively by Dr. Bilchick on Monday, Wednesday and Friday. The control series was treated by Dr. O'Kane. Difference in virulence of organisms, seasonal variations and variations in personnel and class of patients were thereby eliminated. No cases were transferred from the treated group to the control group or vice versa. The children were seen every other day until either cured or, if necessary, admitted to the Babies Hospital. Myringotomies were promptly performed when necessary, as no attempt was made to treat with sulfanilamide alone.

Because the patients were all children in the ambulatory group, sulfanilamide was given only by mouth, together with adequate dosage of bicarbonate of soda. The dosage prescribed varied with the age, size and weight of the children. In computing the dosage an attempt was made to follow the recommendations of Long and Bliss<sup>2</sup> as set forth in their authoritative volume on sulfanilamide under Table II — mod-

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Dec. 7, 1939.

erate dosage; however, reduction in dosage below that recommended above was deemed advisable in many cases.

It was impossible to control the dosage accurately because of the following difficulties:

1. Mothers cannot be persuaded to give an even dosage through the 24 hours because of the inconvenience of waking a child during the night for medication.
2. Replacement dosage following vomiting was uncertain.
3. It was considered dangerous to give large dosage to ambulatory children for fear patients would continue on this dosage without returning when directed, or fail to stop the drug in case of a reaction.
4. It was found impractical from the standpoint of time, expense and technical difficulties to check the blood levels by blood determinations; therefore, the dosage in children ranged from 1.2 gm. of sulfanilamide daily to 3.6 gm., depending upon the size of the child. This is much less than the dose devised by Long and Bliss. It is about the same dosage used by Dr. G. E. Fisher in the series of 183 cases which he reported on June 3, 1939.

*Bacteriological Data:* In order to obviate delays in the administration of sulfanilamide and at the same time to ascertain the effect of sulfanilamide on otitis media caused by organisms other than beta hemolytic strept., the drug was started as soon as the diagnosis was made. A culture was taken at the first visit, but the drug was given to the 55 cases reported, irrespective of the report received. The cultures were reported as follows:

55 Treated Cases	Beta hemolytic strept.....	21
	Pneumococcus .....	10
	Staph. aureus .....	4
	Pfeiffer bacillus .....	2
	Strept. viridans .....	2
	Staph. albus .....	9
Control Series	Beta hemolytic strept.....	18
	Pneumococcus .....	7 (type III) (2 cases)
	Staph. aureus .....	9
	Staph. albus .....	10

*Mode of Treatment:* All cases were treated in the out-patient department. The usual treatment was carried out,

with dry wipes or irrigations where discharge was present. The nose, sinuses and nasopharynx were kept shrunk down and were cleansed when necessary. Those cases with continued discharge for over a week were X-rayed. When mastoiditis seemed well established and operation seemed indicated, the cases were admitted to the Babies Hospital and followed there.

*Reactions:* Six cases developed reactions from the drug. Four had fever, one had severe vomiting. Another had hallucinations after a total dosage of 3.6 gm. All these reactions ceased promptly when the drug was stopped. The results of treatment of 55 cases with sulfanilamide and 48 cases without sulfanilamide are detailed below:

	Sulfanilamide Treated	Control Series
Number of cases.....	55	48
Age .....	6 mos. to 10 yrs.	5 mos. to 11 yrs.
Sex .....	24 males 31 females	26 males 22 females
Unilateral otitis media.....	36	31
Bilateral otitis media.....	19	17
Total number of ears.....	74	65
Number of myringotomies .....	35	43
Total days of discharge after onset of treatment.....	387	600
Average number of days of discharge after onset of treatment .....	7.0	12.6
Total number reactions.....	6	
Admitted for operation.....	9-16%	5
Operated for simple mastoid- ectomy .....	6	4
Operated for revision of sim- ple mastoidectomy.....	3	
Number of complications.....	0	0
Number of deaths .....	0	0

*Bacteriology of the Cases Requiring Mastoidectomy:* Of the nine cases treated with sulfanilamide which required mastoidectomy, all were due to Beta hemolytic strept. Of the four control cases requiring operation, two were due to beta hemolytic strept.; one, staph. aureus; the other, staph. albus.

*Summary:* From this series of cases described, one may conclude that the number of necessary mastoidectomies was not reduced by the administration of sulfanilamide; however, it was noted that the duration of the otitic discharge was markedly decreased — by about one-half. It was also noted

that at times the discharge ceased rapidly when the drug was started. In one case, a discharge present for 23 days due to beta hemolytic strept. cleared up within 24 hours after administration of the drug. It was also noted that several cases of acute otitis media treated by local physicians without myringotomy showed no improvement until myringotomy was performed.

Those cases which had had a mastoidectomy and now suffered from recurrent mastoiditis with pain and tenderness in the mastoid scar were not benefited by sulfanilamide. In all three of these cases incision and drainage of the mastoid scar proved necessary. As suggested by Horan and French,<sup>3</sup> in this type of case, where we know that the pus present is not confined within a layer of mucous membrane in the mastoid antrum as a result of previous surgical interference, it seems logical that little or no benefit is to be expected from the drug. Its only possible beneficial effect would be to reduce the virulence of the attacking organisms.

It is difficult for us to maintain the enthusiasm felt by G. E. Fisher,<sup>4</sup> who reported such brilliant success with sulfanilamide in obviating the necessity for mastoidectomy.

If we analyze his results for January, February and March we find 48 control cases requiring 39 mastoidectomies. Our control series contained 48 cases, with four mastoidectomies. In a personal communication, Dr. Fisher informed us that 65 per cent of his cases were children, so that there is no valid objection to comparing his group with our series, in which all were children. We cannot explain the startling difference in the two control groups.

*Conclusions:* It is our opinion that sulfanilamide should be given routinely to all cases of otitis media under careful supervision; but the surgery of the eardrum and mastoid should be carried out when indicated, irrespective of the administration of the drug.

If the case is one of moderate or extreme severity it should be hospitalized and very large dosage should be used; but excessive reliance upon the drug and neglect of surgery will result in frequent disasters.

REFERENCES.

1. From the Dept. of Otolaryngology, Presbyterian Hospital, Columbia University Medical Centre, Dr. John D. Kernan, Director.
2. LONG and BLISS: The Clinical and Experimental Use of Sulfanilamide, Sulfapyridine and Allied Compounds. The Macmillan Co. 1939.
3. HORAN and FRENCH: Sulfanilamide in the Treatment of Acute Mastoiditis. *Brit. Med. Jour.*, p. 442, Oct., 1938.
4. FISHER, G. E.: Sulfanilamide in the Treatment of Otitis Media. *Jour. A. M. A.*, 112:2271.
5. BAKER, DANIEL C., JR., and BRADFORD, GEO. E.: Sulfanilamide Therapy for Acute Otitis Media and Acute Mastoiditis. *Arch. Otolaryngol.*, 29:333-334, Feb., 1939.

876 Park Avenue.

116 East 53rd Street.

## ERYSIPELAS AS A COMPLICATION FOLLOWING MASTOIDECTOMY. CASE REPORT.\*

DR. H. D. HARLOWE, Virginia, Minn.

One of the less frequent complications following mastoidectomy is erysipelas. From a series of 400 mastoidectomies performed at the Vienna Polyclinic, Brunner<sup>1</sup> and Roenau<sup>2</sup> reported seven cases of postoperative erysipelas, an incidence of 1.8 per cent. According to McKenzie,<sup>3</sup> Miller found the same complication present in 19 cases from a series of 1,358 mastoidectomies, or about 1.4 per cent. Of these cases, 2.5 per cent followed simple mastoidectomy, and 0.6 per cent followed radical mastoidectomy. In reviewing a series of 173 mastoidectomies, Dixon<sup>4</sup> found erysipelas to be a complication in four cases, or approximately 2.3 per cent. Hays<sup>5</sup> stated that out of 4,000 mastoidectomies performed at the New York Eye and Ear Infirmary only 17 were complicated by erysipelas, an average of 0.4 per cent.

Many theories as to the cause of erysipelas have been advanced, yet the exact etiology is still a matter of much dispute. The majority of authors favor the conception that some strain of hemolytic streptococci is the causative factor. Quoting Lanphear,<sup>6</sup> "the disease can be produced by a streptococcus, but evidence of specificity is lacking." According to Angelesco,<sup>7</sup> the specific agent of erysipelas, a streptococcus, is introduced at the moment of operation, or is inoculated later at the time of dressing.

Cases of erysipelas caused by streptococcus pyogenes, staphylococcus, pneumococcus, B. coli and B. typhosus have been recorded. Kopetzky<sup>8</sup> reported five cases of erysipelas following mastoidectomy in which it was possible that B. pyocyaneus was the etiological factor. On the other hand, Rae<sup>9</sup> stated that erysipelas is a clinicopathological entity not produced by a specific organism. From the evidence adduced, Toomey<sup>10</sup> concluded that erysipelas occurs only in individuals who have been previously sensitized, actively or passively, to

\*Read before the Minnesota Academy of Ophthalmology and Otolaryngology, St. Paul, April 12, 1940.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Oct. 24, 1939.



streptococci and their protein products. The beneficial effects produced by sulfanilamide therapy on erysipelas would favor the streptococcus hemolyticus as the etiological factor.

REPORT OF CASE.

*History:* The patient, A. L., a white, married female, age 49 years, was first seen in consultation in April, 1939, at which time a diagnosis of right acute mastoiditis was made. The right ear had been discharging profusely for the past



Fig. 1. Area involved by erysipelas following mastoidectomy.

four weeks. A right simple mastoidectomy was advised and the patient was hospitalized.

*Past and Family History:* Irrelevant.

*Physical Examination:* Revealed a well developed, well nourished white female, weighing 165 pounds. Marked redness and swelling were present behind the right ear over the mastoid region. Pain and tenderness with slight pressure over the region of the right antrum were elicited. The right external auditory canal was filled with a thick, purulent discharge. Perforation of the posterior inferior quadrant of the right

tympanic membrane had taken place. The left tympanic membrane was normal. Examination of the throat revealed chronic infected tonsils. Findings otherwise were normal.

*Laboratory Findings:* Hemoglobin, 80 per cent; red blood cells, 4,200,000; white blood cells on admission, 19,000, and on the second postoperative day, 23,000. Urinalysis, Wassermann test and blood culture were negative. A bacteriological study of the purulent discharge from the right external audi-



Fig. 2. Patient 16 days following right simple mastoidectomy.

tory canal revealed hemolytic streptococci predominating. Roentgenograms of the mastoids showed bony cell destruction in the right mastoid region, but none in the left.

*Treatment and Course:* Temperature on admission was  $39.5^{\circ}$  C., and on the following day was  $37.5^{\circ}$  C. Upon the patient's admission to the hospital, a right simple mastoidectomy was performed. The operation was uneventful and the patient tolerated the surgery well. The second postoperative day the temperature rose to  $40^{\circ}$  C., and the patient developed erysipelas in the region of the right mastoid, which subsequently involved the entire right side of her face.

Roentgen therapy was started at once, which consisted of the administration of 75 radons to rather large fields every second day. The entire course consisted of three treatments. In addition, 20 gr. of sulfanilamide were given orally every six hours. A concentration of at least 10 mgm. of the drug per 100 cc. of blood was maintained by frequent determinations of the blood sulfanilamide content. Following X-ray therapy, local applications of cool, moist dressings of dilute boric acid were applied to the lesion. The recovery was uneventful.

#### COMMENT.

There is a great deal of conflict of opinion regarding the etiology of erysipelas. Dixon contributes too early intervention as an important etiological factor of erysipelas following mastoidectomy. There are, however, various cases of erysipelas following radical mastoidectomy reported in the literature by Neuman, Ruttin, Fraser,<sup>11</sup> Roenau and Brunner.

Kubo<sup>12</sup> concluded that most cases of otogenic erysipelas were related to operation. He found seven such cases directly following operation, and five more which had developed during the after-treatment. Bacteriological study of the purulent secretions from the ear usually revealed hemolytic streptococci, a finding in accord with that of Gorelik.<sup>13</sup>

Lanphear is of the opinion that erysipelas may result from infection during the after-care. Of three cases reported by Mahu,<sup>14</sup> one developed erysipelas during the after-care.

McKenzie believes that a considerable number of cases of erysipelas following mastoidectomy are of autogenous origin. He states also that the streptococcus hemolyticus may vary its behavior to suit its own biochemical environment.

According to Ruttin,<sup>15</sup> the possibility of erysipelas as a mastoid complication is always present; therefore, its early diagnosis may be hard to differentiate from the intracranial complications.

Brunner and Roenau point out that mastoidectomy may be complicated by the phlegmonous type of erysipelas as well as the vesicular or simple bullous form. Phlegmonous erysipelas is found rather frequently following operations for

the removal of cholesteatomas of the middle ear. It is by far the more serious type and often ends fatally.

Honda<sup>16</sup> found that 75 per cent of erysipelas was a complication of otorhinopharyngologic disease. The most common disease associated with erysipelas was otitis media, approximately 32 per cent.

Cseh<sup>17</sup> has observed and treated 19 cases of otitis media which have been complicated simultaneously with erysipelas and scarlet fever. Of this series, erysipelas followed excision of the mastoid cells in 11 cases.

Segall<sup>18</sup> reported several cases of erysipelas following extension from the pharynx to the skin via the Eustachian tube and middle ear. A case of hematogenous metastatic erysipelas of otogenic sepsis was reported by Elserman.<sup>19</sup>

Rosenbaum<sup>20</sup> found the average incubation period of erysipelas following surgery to be 3.6 days. The simple kind of erysipelas extended over a period of 12.6 days; whereas the complicated form had a duration of 19.9 days. Most cases occurred in the spring and summer. The mortality in this series was 6.2 per cent. In facial cases of erysipelas, Erdman<sup>21</sup> found a mortality of 5.3 per cent. McKenzie gave a mortality of 5 per cent in cases of erysipelas following mastoidectomy.

Roentgen therapy for erysipelas given by Freedman<sup>22</sup> consists of the administration of 75 radons to rather large fields repeated every day or second day, depending on the patient's condition. During the entire course, between three and five treatments are given. McNutt<sup>23</sup> states, "To my knowledge, there is no condition that responds so well to X-ray therapy as erysipelas. Our results are almost uniformly successful providing the patient is treated early enough in the course of the disease."

According to Snodgrass,<sup>24</sup> sulfanilamide therapy in the treatment of erysipelas has produced results which are even more efficacious than those previously obtained by ultra-violet radiation.

#### SUMMARY AND CONCLUSIONS.

1. A case of erysipelas complicating mastoidectomy is reported.

2. The exact etiology of erysipelas complicating mastoidectomy is still disputable; however, the majority of writers feel that the streptococcus hemolyticus is the causative organism.

3. In a review of the literature, various methods have been given regarding the treatment of postoperative erysipelas.

4. Sulfanilamide is apparently very effective in the treatment of erysipelas following mastoidectomy.

5. The more recent treatment of erysipelas, using Roentgen therapy and sulfanilamide, appears to be the method of choice.

#### BIBLIOGRAPHY.

1. BRUNNER, H.: Phlegmonous Erysipelas as Focus of Infection Following Mastoid Operation. *Klin. Wchnschr.*, 15:1554-1557, Oct. 24, 1936.
2. ROENAU, E.: Phlegmonous Erysipelas as Focus of Infection Following Mastoid Operation; Five Cases. *Arch. f. Ohren., Nasen. u. Kehlroph.*, 142:214-230, 1936.
3. MCKENZIE, D.: Erysipelas and Hemolytic Streptococcus in Relation to Otolaryngology. *Proc. Roy. Soc. Med.*, 26:1571-1580, Oct., 1933.
4. DIXON, O. J.: Erysipelas as Complication of Early Surgical Interference in Mastoiditis. *Jour. Mo. M. A.*, 27:530-533, Nov., 1930.
5. HAYS, H.: Erysipelas as Complication of Mastoid Operation. *Ann. Otol., Rhinol. and Laryngol.*, 26:823-830, 1917.
6. LANPHEAR, E.: Postoperative Erysipelas. *Amer. Jour. Dermat. and Genito-Urin. Dis.*, 11:407, 1907.
7. ANGELESCO: Erysipele post-operative; traitement. *Presa med. rom., Bucuresti*, 6:358-372, 1899-1900.
8. KOPETZKY, SAMUEL J., and ALMOUB, RALPH: Erysipelas Following Bacillus Pyocyanus Infections in Mastoid Wounds. *Amer. Jour. Surg.*, 2:580-593.
9. RAE: Case of Erysipelas Following Mastoidectomy, Treated with Hiss Leukocyte Extract. *Ann. Otol., Rhinol. and Laryngol.*, 19:736-738, 1910.
10. TOOMEY, J. A.: Critical Review of Experiments Tending to Show Cause and Mechanism of Erysipelas. *Jour. Pediat.*, 12:664-674, May, 1938.
11. FRASER, J. S.: Erysipelas Following Radical Mastoid Operation. *Jour. Laryngol.*, London, 83:472-478, 1913.
12. KUBO, I.: Otogenic and Rhinogenic Erysipelas; Especially Postoperative Forms. *Arch. f. Ohren., Nasen. u. Kehlroph.*, 126:245-251, Oct., 1930.
13. GORELIK, B.: Etiology and Pathogenesis of Erysipelas After Mastoidectomy; Case. *Ann. d'oto-laryngol.*, pp. 930-933, Oct., 1937.
14. MAHU, G.: Erysipelas et mastoïdite. *Ann. d. mal. de l'oreille, du larynx.*, Paris, 12:1090-1094, 1922.
15. RUTTIN: *Ztschr. f. Ohrenheilk.*, 64:1911.
16. HONDA, C.: Otorhinolaryngologic and Statistical Observations in Erysipelas. *Nagasaki Igakkwai Zassi*, 104:19-20, Jan. 25, 1936.

208 HARLOWE: ERYSIPELAS FOLLOWING MASTOIDECTOMY.

17. CSEH, P.: Simultaneous Appearance of Scarlet Fever and Erysipelas in Course of Otitis Media. *Gyogyaszat*, 78:539-541, Sept. 18, 1938.

18. SEGALL, W.: Spread of Erysipelas of Nasopharyngeal Mucosa to External Skin Through Middle Ear. *Wien. med. Wchschr.*, 81:1592, Nov. 28, 1937.

19. ELSERMANN, T.: Purely Hematogenous Sepsis with Metastatic Erysipelas in Flare-Up of Chronic Mesotympanal Otitis Media; Case. *Hals., Nasen. u. Chrenarzt.* (Teill 1), 28:345-358, Dec., 1937.

20. ROSENBAUM, J.: Vorkommen von Erysipel in der chirurgischen Klinik; Abteilung des Dr. V. Angerer (1891-1899), 40:288-301, 1901.

21. ERDMAN: Bell, Textbook of Pathology, 3rd Ed., p. 168.

22. FREEDMAN, E.: Personal communication.

23. McNUTT, J. R.: Personal communication.

24. SNODGRASS, et al.: Comparison of Treatment of Erysipelas with Sulfanilamide and Ultra-Violet Radiation. *Brit. Med. Jour.*, 2:399, 1938.

Lenont-Peterson Clinic.

## DENTIGEROUS CYST OF THE MAXILLARY SINUS. REPORT OF A CASE.

DR. C. W. POND, Pocatello, Ida.

Cysts of dental origin are of two types:<sup>1</sup> 1. Root or periosteal (radicular); and 2. follicular or dentigerous.

The case I shall report deals with the first classification. There are several findings in this report that quite definitely show that it is not a true dentigerous cyst but rather one of inflammatory or root origin.

All of these cysts belong to a group of neoplasms known as odontomas and result from a perverted growth of cells in a tooth follicle. The stimulus which is responsible for the growth may be congenital or acquired.

A short review of the embryology will help better to understand the pathology of these cysts of dental origin.

In the development of a tooth the deeper layer of oral epithelium grows into the mesodermal area of the rudimentary jaw. The latter divides and becomes the primitive organ, which forms in turn the enamel tissue. The papilla, a product of contiguous connective tissue, develops simultaneously with and invaginates the enamel organ. These become encircled by a dental sac which arises from the surrounding mesenchyma. The papilla, the enamel organ and the dental sac form the dental anlage of the tooth follicle.

Some of the epithelial cells of the enamel cease to function, thus becoming a source of dental debris. Probably all cystic odontomas are derived from this group of cells.

The root, or inflammatory or periosteal cyst follows inflammatory changes in the root membrane due to disease or injury to the root membrane involved. This type of cyst comprises about 80 per cent of all odontomas<sup>1</sup> and is usually found in the upper jaw.

The follicular or dentigerous cyst accounts for about 20 per cent and as a rule is found in the mandible. Its occurrence is

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Sept. 15, 1940.



seldom found in the maxilla but occasionally is found even in the gums and orbit.

New<sup>2</sup> reports six cases, of which three were in the upper jaw and three in the lower jaw. Usually the cyst is discovered with or shortly after the second dentition and in persons between the ages of 20 and 30 years.

Cases in connection with deciduous teeth have been reported in persons as young as 9 years, others with three molar teeth as old as 65 years. Bland-Sutton<sup>3</sup> held the view that the dentigerous cyst represents an expanded tooth follicle. Dorrance,<sup>4</sup> that it arises from the enamel sac which surrounds an erupted, supernumerary or abnormal tooth. Most authorities concur in one or both of these views. Others believe that any pathologic condition of the enamel membrane may result in noneruption.

Filled with fluid, the cysts progressively expand, sometimes over a long period of years, with slow absorption of bone and surrounding tissues.

The dentigerous cysts of the antrum are often as large as a hen's egg, and the wall is composed of thick connective tissue, irregular in outline. As a rule lined with pavement epithelium but occasionally the cylindrical type.<sup>5</sup> The cyst may contain serosanguineous or seromucous fluid with degenerated cells and cholesterol crystals. Alden<sup>6</sup> feels that cholesterol crystals play a part in the destruction of bone. This is probably done by a chemical change which takes place in a collection of epithelial debris. This is the same thing that is seen in the accumulation of cholesteatomatous debris from the temporal bone. The action of cholesterol on bone is destructive.

From the walls, teeth may project their free ends into the cyst cavity.<sup>5</sup> Many teeth may be found. Not infrequently, too, teeth impacted concomitantly with cystic formation remain undeveloped because their nourishment is cut off by pressure of the cyst on the nutrient blood vessels.

If no tooth is present, the cyst must be differentiated from other growths in and about the jaws and teeth. Those without teeth are more frequent in the incisor and bicuspid regions.<sup>7</sup> It is essential that there is death of the pulp with

subsequent development of a granuloma. This develops into a cyst because of central degeneration of the granuloma. The pathological sequence is probably: 1. death of the pulp; 2. development of a granuloma; 3. irritation of the so-called epithelial rests by bacterial or other toxins which stimulates them to an overgrowth. This goes on until the lining is epithelialized.

In making a diagnosis, one should differentiate from:

1. Acute dental abscess. This can quite conclusively be done by the dental film and the symptoms.

2. Chronic dental abscess — the X-ray is about all that is needed here.

3. Radicular cyst — contains no teeth; no tooth missing and is usually in the upper jaw.

4. Osteomyelitis — here, tenderness, diffuse swelling and general symptoms of acute inflammation.

5. Maxillary sinusitis — the X-ray film will be of great help if radio-opaque oil is used. Cysts usually are unilateral and the bone either in the floor of the nostril, the canine fossa or the hard palate gives way, becomes parchment-like, and prominent areas are found.

6. Hard odontomas — extremely hard swelling in the region of the canine fossa immovable, shows sharp circumscribed outline in the X-ray. No evidence of metastasis.

7. Adamantoma — slowly growing soft tumors, producing definitely no inflammation. Biopsy alone will give the necessary information.

8. Fibromyxoma, fibromyoma and other benign tumors need biopsy.

9. Malignant tumors — they are: 1. rapid growing; 2. pain in the teeth; and 3. swelling in the soft tissues. Here again, biopsy is necessary.

10. Epulis — this is probably the most common connective tissue tumor seated on the border of the alveolar process about the teeth.<sup>5</sup> It is seldom larger than an olive. It occurs in young adults, and in two varieties, the fibrous and the more

common giant-celled types. Metastasis do not occur but the disease is locally malignant.

*Case Report:* This patient was a young man, age 19 years, who came to my office on March 3, 1938. His only complaint was a hard lump in the left side of the hard palate, well toward the second bicuspid tooth. He also complained of some difficulty in breathing through the nostril on the same side. He thought the left side of his face was more swollen than the right, but he really did not notice this until his attention was drawn to it by his family physician.

He had not been aware of any unusual condition until about three weeks before this history was taken. His family and past histories were irrelevant. So far as he knew, he had never had sinus infection. He had never had a toothache and no permanent teeth had been extracted.

An examination of the nose disclosed an upward lifting of the floor of the left nostril, so that it was difficult to see the anterior end of the inferior turbinate until shrinking had been resorted to. The left maxillary region was slightly more prominent than the opposite side, and the left canine fossa was well filled out. There was a definite bulging downward in the anterior left side of the hard palate, about the size of a five cent piece. This was soft, so that pressure applied pushed it upward and gave it a sensation of bone being destroyed. Transillumination showed the left antrum black. The opposite side was clear. An X-ray film showed the same sinus opaque. A needle was then inserted in the inferior meatus and as soon as the stillette was removed, a straw-colored fluid ran out the lumen. This was cultured and found sterile. About 5 cc. was then aspirated and the same amount of lipiodol injected. Another film definitely outlined a large cyst about the size of a small walnut.

Lateral film of the antrum showed no supernumerary teeth and dental films showed no pathology of the roots.

On March 16, 1938, a local anesthetic was administered as is done when the Caldwell-Luc operation is performed. The usual horizontal incision was made in the canine fossa, extending well to the median line. Then, with careful dissection removed a large encapsulated cyst that involved the

central and lateral incisor teeth. Some of the lining of the maxillary antrum was removed adjacent to the cyst.

A report from the pathologist is as follows: A cyst with broken walls and fibrous lining membrane about 1 mm. thick. Microscopic examination showed the fibrous lining to be very cellular and partly inflamed. Lining epithelium of delicate transitional type in one section and in another of thick squamous type. *Diagnosis:* Dentigerous cyst.

#### BIBLIOGRAPHY.

1. HARRIS, H. LEE, and WEIDLEIN, IVAN F.: Dentigerous Cysts of the Antrum of Highmore with Unusual Characteristics. *Arch. Otolaryngol.*, 12:311, 1930.
2. NEW, GORDON B.: Cystic Odontomas. *Collected Papers of Mayo Clinic*, 6:416, 1914.
3. BLAND-SUTTON, JOHN: Tumors, Innocent and Malignant, pp. 247-249, 6th Ed., London, Cassel and Co., 1917.
4. DORRANCE, G. M.: Etiology, Pathology and Treatment of Cysts of the Jaw. *Jour. A. M. A.*, 77:1883, Dec. 10, 1938.
5. GOODYEAR, HENRY M.: Follicular Dental Cyst Operation. *THE LARYNGOSCOPE*, 38:228, 1928.
6. ALDEN, ARTHUR M.: The Radicular Cyst Which Invades the Bones of the Face. *Arch. Otolaryngol.*, 19:348, 1934.

## NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLARYNGOLOGY.

Meeting of Feb. 21, 1940.

### SYMPOSIUM ON NASOPHARYNGEAL TUMORS:

#### (a) Diagnoses:

- (1) Pathological. Dr. Arthur P. Stout.
- (2) Otolaryngological. Dr. James W. Babcock.
- (3) Neurological. Dr. Samuel Brock.
- (4) Roentgenological. Dr. Cornelius G. Dyke (lantern slides only).

#### (b) Treatment:

Roentgenological. Dr. Haig H. Kasabach (by invitation).

#### DISCUSSION.

DR. KAUFMAN SCHLICK: These papers have been very interesting and thorough. It would be difficult to add to them, but I would like to reiterate a few of the important features mentioned this evening.

The first speaker said that these tumors were very rare. The last speaker showed 130-odd cases from the Mayo Clinic, and almost 60 cases of his own, and so on down the line. Very many more cases have been reported today, so that they are not so uncommon.

In some of these cases the diagnosis is not difficult, but many cases present one or two or three symptoms that should make one suspicious. In any obscure case of head pains in the face or about the eye or ear, with involvement of cranial nerves, the possibility of nasopharyngeal growth must be borne in mind. If one is familiar with the condition and is so minded, the diagnosis would be made more often and, what is more important, earlier. Often a tumor in the nasopharynx cannot be detected, as was brought out by two of the speakers this evening. Many such cases were mentioned by Dr. Dyke, who said that the tumor was not discovered because it had gone so far back. They may grow under the mucous membrane of the nasopharynx and spread posteriorly, so that by the time they show in the pharynx they are ulcerated or hemorrhagic and, of course, very far advanced. Nevertheless, even in earlier cases there may be extensive involvement of the cranial nerves and metastases to the cervical region.

In July, 1923, in the *Archives of Ophthalmology* I reviewed 38 cases of malignant tumors of the nasopharynx observed at Mt. Sinai Hospital, 22 of which had only local signs, as was brought out so well this evening. In this group, 13 cases had cervical gland enlargement. Sixteen patients in this series showed signs referred to the eye. The ocular signs were as follows: Involvement of the Vth nerve, 12 cases out of 16; Horner's syndrome, complete or incomplete, 10 cases; involvement of the VIth nerve, six cases; involvement of the facial nerve, five cases. Other signs were exophthalmos, three cases; ptosis, two cases; papilledema and mass in the orbit, one each. Two patients showed sphenoidal fissure syndrome. Other signs in this group were referred to the ear. Fourteen cases out of 16 showed symptoms referred to the ear. The nasopharynx was affected in six, with swelling of the neck in five. Practically all of the cranial nerves were involved in some cases. Two had a jugular foramen syndrome. The most commonly affected nerves were the Vth, a portion of the sympathetic, the VIth and the facial.

The diagnoses that were considered in some cases were as follows: Mastoiditis, syphilis, cerebral neoplasm, expanding tumor, encephalitis, infectious process involving the meninges, chronic thrombosis of the cavernous sinus.

The following operations were performed before the correct diagnosis was made: Operation on nasal septum and nasal sinus, paracentesis of the ear, extraction of teeth (mainly because of pain), mastoidectomy injection of the sphenopalatine ganglion, and there was one case of craniotomy. In some of these cases several operations were performed.

The sympathetic nervous system may be involved in the neck, with or without cervical gland involvement, with ocular signs. There was sympathetic nervous system involvement in 10 patients of this series, and the cervical glands were involved in only five. The group with local lesions numbered 13. Undoubtedly, as Dr. Brock has shown, in many cases the sympathetic nervous system is involved higher up than the cervical region. In this group of patients with ocular symptoms, the cervical glands are not as common as usually reported. Horner's syndrome is frequently an important sign. When ocular signs are present, the tumor has already invaded the skull.

In conclusion, I wish to offer an ocular syndrome that can be evolved from these cases. Involvement of the Vth, sympathetic and VIth nerves, either individually or together, with symptoms referable to the ear, are strongly suggestive of malignant nasopharyngeal tumor.

DR. RUDOLPH KRAMER: This subject has been so thoroughly covered by the previous speakers that it leaves nothing to say except to emphasize the points they have made; however, I do want to congratulate the representatives of the Radiotherapeutic Department of Presbyterian Hospital on their amazing results. I know of no results comparable in the treatment of nasopharyngeal malignancy. I know it has always been a sickening experience to me to see these patients come in, because it means a sad and painful end to most of them.

As far as benign lesions are concerned, to the otolaryngologist the most common tumefaction in the nasopharynx is the cyst. By far the predominating tumor is generally a retention cyst in the median line, occasionally due to the so-called Tornwaldt's abscess, or more commonly to occlusion of a cleft or a mucous gland. The reason the pathologist never sees them is because they are generally handled by the rhinologist as an ambulatory patient.

There is one symptom common to most of these tumors, whether benign or malignant, and that is a sensation of stuffiness in the nose, at times associated with stuffiness in the ear. It has been very disheartening, from my experience and also listening to the statements made here tonight, to find that a certain number of malignant cases do not show these symptoms early. I think I have the explanation, which doesn't help us any, but it makes difficult any possibility of getting better results with our present therapy in certain of these cases. Every once in a while a patient is seen with extensive osseous involvement of the cranium, and one looks in the nasopharynx for a tumor that one knows must be there, and after careful search one may find a small nodule with a normal mucous membrane surface—a nodule no more than the size of a pea or bean, and if you remove that you will find you have the source of your extensive lesion. But it requires careful search and it is generally only detectable by direct examination with the nasopharyngeal speculum. It is very understandable, then, why a case such as this gives no symptoms until the adjacent endocranium or orbit is involved.

There are, however, a fair number of cases that present early symptoms—stuffiness in the nasopharynx or the ears, and occasionally some blood-streaking in the postnasal discharge or discharge from the nose. Unfortunately, the patient may see a general practitioner who says, "It is nothing—it will pass

off." Four or five months later, he consults a rhinologist who detects the lesion, but in the meantime valuable time for therapy has been lost. It is true that the otologist and rhinologist have also been remiss, either in neglecting to examine the nasopharynx thoroughly or neglecting to examine it at all. In any slight deviation from the normal in a suspicious case a biopsy must be done, and if this biopsy is negative it must be repeated. I have gone in two or three times before obtaining a positive biopsy.

Our results have been bad. None of our bone cases have gotten well. We have had three cases of nasopharyngeal malignancy that have been well for four and one-half to five years; however, I am optimistic, both because of Dr. Lenz's report and from what I have seen. We have had a few post-mortem examinations in patients who survived two to three years after radiotherapy, and while they died from metastases or other causes, the nasopharyngeal lesion had been entirely destroyed; so that if we get them soon enough and treat them soon enough, radiotherapy can get rid of the disease, and if the adjacent bone is not involved we have a fair chance of curing some of these patients.

DR. ISRAEL WECHSLER: I have a double grievance—first, the papers were so complete that there is really little to add; and, secondly, the discussers have filled in whatever gaps there were. Dr. Brock covered the field so thoroughly from the neurological point of view that I might have known in advance that there would be little for me to say.

I might say a word or two about diagnosis. It is both easy and difficult to diagnose tumors at the base of the brain. There are no specific neurological criteria to determine early in their course the nature or cause of cranial nerve involvement. There are so many possible causes which must be borne in mind, both general medical and neurological. To state that there is an internal or external strabismus is merely to say that a given nerve or nucleus is affected. We must, therefore, look for other signs and symptoms to help in the diagnosis. What the neurologist wants to know is, is there any extracerebral or an intracerebral lesion? If it is intracerebral, he looks for signs and symptoms pointing to involvement of adjacent structures. When the peripheral nerve alone is involved the neurologist must decide whether it is intracranial or extracranial, whether the meninges, skull or extracranial structures are affected.

The type of tumor under discussion always involves more than one nerve. The reason the Vth and VIth nerves are most commonly involved is that the tumor naturally tends to invade the middle fossa, although neither the posterior nor the anterior is spared. The VIth nerve has the longest course outside of the brain, and crosses the middle fossa to go to the eye. The point made by Dr. Brock that the trigeminal pain is accompanied by objective signs, both sensory and motor, is characteristic and important. Unless one finds such signs, one cannot distinguish the pain from trigeminal neuralgia. I have seen one instance where the patient was thought to be getting well because the pain disappeared, but it was because the nerve had been destroyed, and it really represented an advance of the disease.

Very rarely does one see papilledema, and this is very understandable since papilledema results from increased intracranial pressure. In nasopharyngeal tumors we are dealing with an extracerebral lesion, and it is extremely late in the course that interference with the cerebrospinal fluid circulation within the skull occurs.

Generally speaking, we find that the neurologist has a little less difficulty in making a diagnosis than the otolaryngologist. Malignant tumors are not the only ones encountered. Meningiomas, neurofibromas and many other types occur in this location. Whenever the neurologist finds involvement of the nerves of the middle fossa, he invariably looks into the nasopharynx to see



if there is any tumor. One should distinguish paralysis of the palate from mechanical interference, as the uvula and palate may not move because of interference by involvement of the tumor. By the time one observes glands in the neck or back of the jaw, the conclusion is justified that one is dealing with a fairly late process; then the diagnosis is comparatively simple. Early diagnosis, however, though not so simple, can and should be made, and must be if radiotherapy is to be effective.

DR. MAURICE LENZ: Dr. Kasabach's report is one of very few in which an attempt has been made to study the clinical characteristics and reactions to radiotherapy of malignant neoplasms of the nasopharynx, grouped according to their microscopic characteristics.

It has been mentioned that many difficulties are encountered in treating these tumors by radiotherapy. The silent character of the growth, the difficulty of visualizing the tumor when it is small and the consequently late clinical diagnosis account for the extensiveness of the majority of these neoplasms when the patient is referred for radiotherapy. The proximity of bone and cartilage facilitate the invasion of these structures by overlying growth. Chondro- or osteonecrosis easily result from overintensive irradiation, especially from such local sources as radon seeds or nasopharyngeal applicators.

On admission, 30 per cent of all cases had extension to adjacent bone, and only three of 17 patients with evidence of this extension survived three years. Seventy-seven per cent of all patients showed clinical involvement of regional nodes, and none of the 23 patients with bilateral regional metastases survived 15 months. The seven who at present are free from clinical evidence of cancer five years or more after treatment were all cases with small unilateral nodes or no nodes.

It is quite evident from this review that early diagnosis is of paramount importance. Because of the deep location of the nasopharynx, only a fraction of the irradiation applied externally by the usual 200 kv. X-ray therapy reaches the site of the primary tumor. If the tumor is extensive and if its inherent radiosensitivity is not marked, it is very difficult to control it by irradiation. Thorough clinical examination to determine as accurately as possible the extent of the involvement and microscopic classification of the tumor are important in planning the treatment. The daily and total dosage are guided not only by the extent of the tumor and its probable radiosensitivity as suggested by its microscopic appearance, but also by the tolerance of the patient. Frequent observations of the patient during the course of radiotherapy are, therefore, part of the treatment. Additional retardation of growth in cases in which neoplasm has not been destroyed can be accomplished only if failure is discovered early. This suggests that long-continued follow-up is of great importance.

While the results of radiotherapy are as yet very modest, they are so much superior to those of surgery and the cautery that there is no question as to which is the best type of treatment.

Dr. Kasabach has made a careful analysis of a difficult problem and should be congratulated for his work.

DR. JAMES EWING: It is an agreeable and instructive experience to listen to a series of papers by experts on this important and difficult subject.

I would congratulate Dr. Stout on the excellence of the material from which he can make such beautiful sections. We get very small bits of material, usually badly crushed, and from these we are expected to do detective work and make an accurate diagnosis.

May I suggest that the typical lymphoepithelioma with syncytial cell masses was first described by Regaud, while Schmincke described a somewhat different structure which is difficult to distinguish from lymphosarcoma?

I think perhaps the audience and the surgical colleagues of Dr. Stout do not realize the difficulties he encounters, for this field is the acid test of the pathologist. Every type of tumor must be expected in this region—in fact, I don't know of any well recognized type that may not appear in this location, either as a metastasis or a primary growth, so that one must call upon a broad experience in making a diagnosis.

I would also like to mention what has impressed me, and that is the rather frequent occurrence of carcinoma of the nasopharynx in children. In the first decade and a half they are nearly always overlooked—almost never recognized until the symptoms are far advanced and the condition very serious.

I am much interested in the progress of radiation therapy in this field, and am glad to know that the surgical approach is being discarded. Attempts at surgical extirpation caused great distress, with direful results, and it is good to know that surgery has now been definitely replaced by radiation. I do not know, however, that all therapists would discard entirely the interstitial or intracavitary application of small doses of radon, but we have certainly abandoned the effort of doing the whole thing by seeds.

It has been said, if these tumors are radiosensitive, why don't we get better results? It is because of metastases and bone involvement. I wonder if those in charge of treating these cases have considered the possibility of introducing radiation therapy earlier in that whole group of nasopharyngeal disorders in which the diagnosis of cancer is suspected but cannot be positively made. It is wise to be cancer-conscious and to suspect cancer when those early symptoms are apparent but not positive. If you are going to wait for radiological evidence of bone destruction, then you have a very difficult problem, since heavy radiation so frequently has serious sequels in this region. Radiation is a controller of growth, both neoplastic and inflammatory, and where the diagnosis of cancer is not clear but the possibility is present, it would seem wise to undertake a therapeutic test by radiation.

This Society would do well to prepare a statement on the earliest signs of nasopharyngeal tumors, to be distributed to the public and to doctors. Get them early and you may get better results.

DR. WILLIAM S. MACCOMB: The papers presented this evening have been very interesting. I have been greatly impressed by Dr. Dyke's demonstration on the Roentgenogram, especially by the laminographs, which we have not used as yet at Memorial Hospital for tumors of the nasopharynx. Dr. Ewing has mentioned already the occurrence of nasopharyngeal carcinoma in the first and second decades of life. Our youngest patients were, I believe, age 5 and 7 years. In these first decades of life we find that metastases occur early.

One of the greatest problems in this group of tumors is the treatment of recurrences, and I shall be very interested in learning how these recurrent tumors are treated. Several patients in the Head and Neck Clinic at Memorial Hospital have developed recurrent cancer locally in the nasopharynx even after Roentgen irradiation supplemented by nasopharyngeal capsule of radium.

DR. JAMES W. BARCOCK: I didn't mention any age incidence. The youngest patient we had with malignant tumor of the nasopharynx was 11 years, and the average was in the 40's—I think, approximately 45 years. We have no cases under the age of 11 years.

DR. CORNELIUS G. DYKE: Dr. Golden called me at 6:00 o'clock this evening to say that he was unavoidably detained, and asked me to stress two points for him.

The Roentgen diagnosis of malignant tumors of the nasopharynx is dependent primarily upon the detection of bone destruction, particularly of the base

of the middle fossae, and I think this was demonstrated in the various Roentgenograms which were shown tonight. Before bone destruction can be demonstrated a diagnosis of malignant disease cannot be made by this means.

The second point he wished to emphasize was that in the use of the laminagram, or any other serial sectioning device, it is important in coronal or sagittal sections that the subject being radiographed should be centered properly. There must not be any obliquity. This is particularly true of the coronal sections, so that it is possible to compare the right and left sides of the head.

Laminagrams at present are difficult to interpret and diagnoses from their study should be made in conjunction with ordinary Roentgenograms.

---

#### LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

The following list of officers in the Los Angeles Society of Ophthalmology and Otolaryngology for 1941 were appointed:

President: Dr. Harold Mulligan.

Vice-President: Dr. Ben Dysart.

Secretary-Treasurer: Dr. Colby Hall.

Committeeman: Dr. John P. Lordan.

Meetings are held in the Los Angeles County Medical Association building, 1925 Wilshire boulevard, Los Angeles, at 6:00 P.M., fourth Monday of each month, from September to May, inclusive.

#### AMERICAN OTOLOGICAL SOCIETY, INC.

The Seventy-fourth Annual Meeting of the American Otological Society will take place on May 26 and 27, 1941, at the Marlborough-Blenheim, Atlantic City, under the Presidency of Dr. George M. Coates.

A very interesting program pertinent to our specialty and world affairs today is being planned by our President. The guest of honor of the Society will be Dr. Wells P. Eagleton, for whom 1941 marks the forty-fifth anniversary of his membership in the American Otological Society.

At a later date the management of the Marlborough-Blenheim will send cards to the members of the American Otological Society to facilitate their making reservations at the hotel.

Your attention is directed to the importance of filling out the Biographical Questionnaire which was sent you some time ago. In case this has been misplaced or lost, a duplicate will be sent upon application to the Secretary. It will add much to the value of the record to have your photograph included but do not let the absence of a photograph serve to delay the return of the questionnaire. The records that are being assembled now will be of great historical value in years to come.

